TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

1.1 GENERAL

Simpson Timber Company ("Simpson") owns and manages approximately 287,000 acres of commercial timberland in Washington (Figure 1). To date, its forest management practices have not been seriously constrained by restrictions imposed under the Endangered Species Act (as amended, the "ESA"). However, in the face of an increasing number of petitions filed under the ESA to classify various species of fish as "threatened" or "endangered", Simpson has elected to engage the National Marine Fisheries Service ("NMFS") and the U.S. Fish and Wildlife Service ("USFWS") in conservation planning efforts on approximately 91 percent of its Washington timberland holdings.

The following plan has been prepared with the assistance of NMFS and USFWS, among others (see Appendix H), and is intended to satisfy the requirements of Section 10 of the ESA. Based upon the commitments reflected in this plan, Simpson expects to receive an incidental take permit ("ITP") for all fish, amphibian, and wildlife species designated in Tables 1 and 2. Such a permit should allow Simpson to avoid the uncertainty inherent in the current regulatory climate and should afford Simpson with a continued opportunity to harvest timber resources from its lands. An even flow of timber resources is essential to the viability of Simpson's manufacturing facilities and the economic health of the surrounding communities located in the vicinity of Shelton, Washington.

1.2 CORPORATE PHILOSOPHY

Simpson is a privately held company with a long tradition of responsible resource stewardship and citizenship. The foundation of Simpson's success is the management of its fee-owned timberlands and related businesses spread across Washington, Oregon and California. While these lands are private, Simpson understands that events, natural or otherwise, that occur on its property can have impacts that extend beyond the boundaries of its ownership. Through the application of research and sound science, Simpson is committed to understanding these impacts and, where practical, mitigating any significant consequences resulting from its management activities.

As a forest products company, Simpson's business is of a long-term nature. Given that this is the character of the business, a stable operating and regulatory environment is critical. While Simpson's Washington operations are not now seriously constrained by the limitations of the ESA, Simpson views this Habitat Conservation Plan ("HCP" or "Plan") as a vehicle for accelerating the arrival of regulatory stability.

The process of developing this plan encompassed business, legal, scientific, regulatory, political and ideological issues and tradeoffs. There were no quick or simple solutions to the many difficult issues addressed in this plan. The process of developing the particular prescriptions identified below was a time-consuming and highly iterative process involving countless internal corporate discussions as well as substantial input from state and federal agencies, local Indian Tribes, environmental groups and other interested parties. Simpson believes that the resulting plan, while costly to develop and costly to implement, is the best possible approach for dealing with the complex web of issues surrounding the management of its property in a manner that leads to constructive results for the company, its community and the environment.

Figure 1. Initial Plan Area and vicinity.

Note: this figure is available for viewing as a separate file.

Simpson believes that implementation of the plan should yield the following benefits:

- The resource base, from a scientific perspective, is placed on an improving trend line as a result of Simpson's conservation practices.
- Simpson's activities will yield a net benefit to a wide range of listed and sensitive fish and other wildlife species.
- With greater certainty, Simpson will be able to operate in an economically rewarding manner.
- Simpson will be able to continue to harvest its timber on a long-term sustainable basis, which will yield positive results for the company and for the communities dependent upon Simpson for jobs and economic health.
- All of Simpson's actions will be consistent with Simpson's overall commitment to responsible stewardship.

1.3 GOAL OF PLAN

The following HCP has been designed to: (1) minimize and mitigate any incidental take of the covered species described herein which may occur as a result of Simpson's forest land management, and (2) to ensure that any such taking will not appreciably reduce the likelihood of the survival and recovery of such species in the wild. Implementation of the complementary suite of conservation measures described below will meet and actually exceed these requirements, by contributing to the maintenance and development of intact, ecologically connected, and naturally functioning aquatic and riparian ecosystems.

1.4 SPECIES ADDRESSED IN THE PLAN

Upon signing, the HCP and the ITP provide immediate ESA coverage for a discrete list of fish, amphibians, and wildlife. These species are listed in Table 1 and Table 2.

1.4.1 Aquatic Dependent Species

Thirty aquatic species have been specifically identified for ESA coverage and conservation under provisions of this HCP. The aquatic species list is composed of species that are either entirely dependent on aquatic habitat or closely associated with the margins of channels and riparian habitats for all or a portion of their life. This list is not all-inclusive for aquatic species within the Plan Area and there were various reasons for including or excluding particular species from the list. For about one half of the species, there is an expectation that they may, if they have not already, come under ESA conservation status. These species include all of the salmonids, the stream breeding amphibians, the Van Dyke’s salamander, two species of lamprey and the western toad. Several other species are on the list due to anomalous regional or Plan Area distributions or because there has been conservation concern voiced by state agencies or Indian Tribes. Species in this category include the Olympic mudminnow, threespine stickleback, longnose dace and the reticulate, riffle and shorthead sculpin. The other species on the list are generally cosmopolitan in their distribution and are included because their coverage demonstrates expected conservation results that may apply to other species for which no explicit analysis is provided.

The Plan Area encompasses multiple evolutionarily significant units ("ESU") for all salmonid species; thus a single species may benefit from conservation and recovery efforts for other salmon ESUs. For example the status of Puget Sound/Strait of Georgia chum does not warrant their listing, whereas the Hood Canal summer run chum are listed as threatened. Likewise, Puget Sound chinook are listed as threatened, but the NMFS Status Review for chinook concluded that the Washington Coastal ESU did not warrant listing. Status reviews are complete for all salmonid species within the Plan Area except Dolly varden. Status reviews for steelhead, coho, and pink salmon resulted in candidate status for coho in the Plan Area but no special status for steelhead or pink salmon. In total, 13 of the 30 species listed in Table 1 have been recognized for special conservation and recovery status by state or federal agencies in the Pacific Northwest.

1.4.2 Wildlife Species

Simpson's management prescriptions also will directly benefit 21 wildlife species (identified in Table 2) that are not included in the aquatic species associations of Table 1. Species that rely on snags to meet a majority of their nesting requirements are grouped together separately in Table 2, according to three snag size class requirements. These classes are defined as: Class 1: 8.0-14.0 inches DBH; Class 2: 14.1-20.0 inches DBH; and Class 3: >20 inches DBH.

Federally listed endangered species do not inhabit the Plan Area; however, three wildlife species listed as threatened by the USFWS potentially exist in the Plan Area: the marbled murrelet, the bald eagle and the northern spotted owl (*Strix occidentalis*). Simpson is requesting an ESA Section 10 Incidental Take Permit for the marbled murrelet and bald eagle. No incidental take of the Northern Spotted Owl is requested as part of this HCP.

Conservation measures have not been specifically included in this HCP to protect northern spotted owl habitat and no incidental take of the northern spotted owl is requested as part of this HCP. However, Simpson will protect the spotted owl by following state and federal regulations. Current state regulations require landowners to protect the best 70 acres of nesting and foraging habitat centered around northern spotted owl nest sites during the nesting season. Timber harvest, yarding and road building are not allowed within these areas unless surveys show that spotted owls no longer are nesting in these sites.

Table 1. Aquatic and riparian dependent species addressed by the Simpson HCP.

Species	Federal[1] Status	State Status
Headwater Species Association		
Torrent salamander (*Rhyacotriton olympicus*)	FSC	SM
Tailed frog (*Ascaphus truei*)	FSC	SM
Cope's giant salamander (*Dicamptodon copei*)		SM
Western redback salamander (*Plethodon vehiculum*)		
Steep Tributary Species Association		
Cutthroat trout (*Oncorhynchus clarki clarki*)	FPT	
Shorthead sculpin (*Cottus confusus*)		
Van Dyke's salamander (*Plethodon vandykei*)	FSC	SC
Flat Tributary Species Association		
Coho salmon (*Oncorhynchus kisutch*)	FC	
Chum salmon (*Oncorhynchus keta*)	FT	
Riffle sculpin (*Cottus gulosus*)		
Coast Range sculpin (*Cottus aleuticus*)		
Reticulate sculpin (*Cottus perplexus*)		
Speckled dace (*Rhinichthys osculus*)		
Brook lamprey (*Lampetra richardsoni*)		
Mainstem Species Association		
Chinook salmon (*Oncorhynchus tshawytscha*)	FT	
Steelhead trout (*Oncorhynchus mykiss*)		
Pink salmon (*Oncorhynchus gorbuscha*)		
Bull trout (*Salvelinus confluentus*)	FT	
Dolly varden (*Salvelinus malma*)		
Torrent sculpin (*Cottus rotheus*)		
Longnose dace (*Rhinichthys cataractae*)		
Pacific lamprey (*Lampetra tridentatus*)	FSC	
River lamprey (*Lampetra ayresi*)	FSC	
Western toad (*Bufo boreas*)	FSC	
Lentic Species Association		
Prickly sculpin (*Cottus asper*)		
Olympic mudminnow (*Novumbra hubbsi*)		SC
Threespine stickleback (*Gasterosteus aculeatus*)		
Northwestern salamander (*Ambystoma gracile*)		
Long-toed salamander (*Ambystoma macrodactylum*)		
Red-legged frog (*Rana aurora*)		

Federal Status Codes:
FE - Federally Endangered
FT- Federally Threatened
FC - Federal Candidate
FSC - Federal Species of Concern
FPT – Federal Proposed Threatened

State Status Codes:
SE - State Endangered
ST - State Threatened
SC - State Candidate
SS - State Sensitive
SG - State Game Species of Concern
SM - State Monitor

[1] Indicated for ESUs within the Plan Area only.

Table 2. Wildlife species addressed by the Simpson HCP.

Species	**Federal Status**	**State Status**
Marbled murrelet (*Brachyramphus marmoratus*)	FT	ST
Bald eagle (*Haliaetus leucocephalus*)	FT	ST
Harlequin duck (*Histrionicus histrionicus*)	FSC	SG
Band-tailed pigeon (*Columba fasciata*)		SG
Roosevelt elk (*Cervus elaphus Roosevelti*)		SG
Class 1 Snag Dependent Species		
Downy woodpecker *(Picoides pubescens)*		
Black-capped chickadee *(Parus atripcapillus)*		
Class 2 Snag Dependent Species		
Western bluebird (*Sialia mexicana*)		SM
Purple martin (*Progne subis*)		SC
Chestnut-backed chickadee *(Parus rufescans)*		
Red-breasted sapsucker (*Sphyrapicus ruber*)		
Tree swallow (*Tachycineta bicolor*)		
Violet-green swallow (*Tachycineta thalassina*)		
Hairy woodpecker (*Picoides villosus*)		
Western screech owl (*Otus kennicottii*)		
Northern pigmy owl (*Glaucidium gnoma*)		
Northern saw-whet owl (*Aegolius acadicus*)		
Northern flicker (*Colaptes auratus*)		
Class 3 Snag Dependent Species		
Pileated woodpecker (*Dryocopus pileatus*)		SC
Wood duck (*Aix sponsa*)		SG
Common merganser (*Mergus merganser*)		SG

Note: Snag dependent species are grouped according to similar snag requirements – Class 1: 8.0-14.0 inches DBH; Class 2 14.1-20.0 inches DBH; Class 3: >20.0 inches DBH.

Federal Status Codes:
FE - Federally Endangered
FT- Federally Threatened
FC - Federal Candidate
FSC - Federal Species of Concern

State Status Codes:
SE - State Endangered
ST - State Threatened
SC - State Candidate
SS - State Sensitive
SG - State Game Species of Concern
SM - State Monitor

1.5 ACTIVITIES

Activities to be covered by the HCP and the ITP include most aspects of Simpson's forest practices and related land management. This HCP and the ITP are also intended to cover certain monitoring activities and the conduct of related scientific experiments in the Plan Area.

Activities covered by this plan include all aspects of mechanized timber harvest, log transportation, road construction, maintenance and decommissioning, site preparation and slash abatement, tree planting, fertilization, silvicultural thinning, experimental silviculture, wildfire suppression, stream restoration, research and monitoring pursuant to Section 9 of the HCP, management and harvest of minor forest products and vertebrate control. During the plan period Simpson will apply pesticides in the Plan Area as needed to control vegetation and organisms that may suppress or inhibit tree growth. All pesticides will be applied in accordance with applicable regulations of the Environmental Protection Agency ("EPA") and applicable laws of the state of Washington. The application of pesticides is not a covered activity under the ITP because the USFWS and the NMFS do not grant Incidental Take Permits for pesticide applications; those activities are covered by incidental take statements issued in connection with Section 7 consultations between the USFWS and/or the NMFS and the EPA.

Covered activities include the following:

Mechanized Timber Harvest: Management of lands for commercial timber production. Simpson intends to manage its lands, outside of conservation areas, primarily using clearcut harvest methods with an average rotation age of 40-50 years. Specific activities included within this description include: stream typing and classification (using electro-fishing equipment in accordance with guidelines of the WDFW and endorsed by the Services), unit layout, felling of timber, bucking of timber and yarding of timber with ground, tower, or aerial logging systems.

Log Transportation: Transportation of logs to mills in Shelton vicinity via road and railroad.

Road Construction, Maintenance, and Decommissioning: Construction, maintenance and decommissioning of roads. Simpson will construct roads as needed for its commercial timber production and associated land management. Roads will be constructed and maintained according to standards described in this HCP. Examples of specific activities include the surfacing of roads, the clearing and maintenance culverts, the decommissioning of certain roads and the closing of certain roads to motor vehicle access.

Site Preparation and Slash Abatement: Scarification and burning of slash in accordance with applicable laws for the state of Washington in management units harvested by clear cutting.

Tree Planting: Planting of trees. Simpson will typically plant 250-400 trees per acre within 18 months following harvest.

Fertilization: Fertilization of trees to accelerate growth in accordance with applicable laws for the state of Washington. Typically, Simpson will fertilize certain timber stands within the plan area up to two times between ages 15 and 40 with the application of approximately 440 pounds of nitrogenous pelletized fertilizer per acre.

Silvicultural Thinning: Thinning in some or all of the timber stands in the plan area prior to clearcut harvest, including, commercial thinning and pre-commercial thinning in stands younger than 30 years old.

Experimental Silviculture: Conducting experimental silvicultural practices such as implementing alternative forest management methods for some units, practicing uneven-aged management, engaging in partial cutting and seed tree management, feathering mature leave trees along outer edges of riparian forest buffers; manipulating various stands to speed conversion of hardwood riparian stands to conifer and creating snags via blasting or cutting methods.

Wildfire Suppression: Prevention and suppression of wildfires consistent with Washington State Department of Natural Resources fire suppression plans.

Stream Restoration: Establishment of a limited number of pilot projects to pursue alternative approaches to stream restoration.

Research and Monitoring: Conduct of research and monitoring pursuant to Section 9 of this HCP.

Minor Forest Products Management and Harvest: Permitting the harvest of minor forest products from the plan area. Such products could include, among others: firewood, salal, ferns and mushrooms. The following defines the scope of current and potential future minor forest products permits.

Type of Minor Forest Product	Acres of Area Permitted in 1997	Estimated Potential Range of Acres Permitted Each Year of the HCP Period
Firewood	4,200 acres	4,000 to 5,000 acres per year
Floral Brush	61,000 acres	50,000 to 60,000 acres per year
Mushrooms	3,000 acres per year	2,000 to 7,000 acres
Ferns	400 acres	Unknown

Vertebrate Control: Engaging in vertebrate control as necessary to control damage to plantation seedlings. Currently such control is limited to mountain beavers and no other vertebrate control is currently anticipated.

Notwithstanding the foregoing to the contrary, however, until completion of all required consultation under the National Historic Preservation Act, 16 U.S.C. § 470(f), "Covered Activities" shall not include any activity that but for the ITP would constitute unlawful take of a Covered Species and that will adversely affect a Designated Historic Resource. As used in this definition, "Designated Historic Resource" means any site, building, structure, or object located within the Plan Area (a) that is included in the National Register of Historic Places or (b) that is (i) specifically identified in a writing received by Simpson prior to the conduct of its activity from either Service or from any Interested Party and (ii) is eligible for inclusion in the National Register of Historic Places. As used herein, "Interested Party" means the Washington State Historic Preservation Officer, each Indian Tribe that attaches religious and cultural significance to sites, buildings, structures, or objects that may be affected by the activity and each other "consulting party" under 36 CFR §800.2. The Services may elect to conduct phased consultations by subregions within the Plan Area under 16 U.S.C. § 470(f) and consultation will be deemed to have been completed prior to any Simpson activity if the Services' obligations to consult with respect to the subregion where such activity is to be conducted has been completed.

1.6 TERM OF THE HCP

This HCP has a 50-year term expiring on the 50th anniversary of the date on which the first ITP is issued hereunder. All species in Table 1 and Table 2 are covered for the term of the plan. The IA describes certain circumstances under which the HCP may be terminated earlier, as well as provisions permitting Simpson to extend the term of the HCP for an additional fifty years.

2 CHARACTERISTICS OF THE PLAN AREA

2.1 PLAN AREA

Simpson proposes to manage approximately 261,575 acres of its Washington properties pursuant to this HCP. The Plan Area extends into the southern foothills of the Olympic mountains and across the Wynoochee River valley to the City of Aberdeen's Wishkah watershed. Adjacent lands are owned to the north by the U.S. Forest Service ("USFS"), to the west by the City of Aberdeen and Weyerhaeuser, to the south by Weyerhaeuser, Port Blakely Tree Farms, L.P., other smaller private owners, and the Washington State Department of Natural Resources ("DNR"), and to the east by numerous small land owners (Figure 2).

During the HCP period Simpson may make simple fee purchases of lands within the area encompassed by the HCP boundary (Figure 1)[2]. Simpson may add lands to the HCP via the HCP minor amendment process, described in the IA. All conditions of this plan also would apply to the new lands added to the HCP by Simpson. Simpson's management on these lands also would receive ITP coverage, in accordance with the provisions of the HCP and associated Implementation Agreement.

2.2 LANDSCAPE STRATIFICATION

At a fundamental level, ecosystem structure and dynamics are influenced by geologic settings, climatic factors and their interaction. Any site specific, science-based approach to landscape management must account for these essential influences because they are largely responsible for much of the natural variation in habitat types at various spatial and temporal scales. This variation in habitat type directly controls the distribution of species and biological communities and has a strong linkage to their response to disturbances. At least as important, from a land use perspective, is the way in which these fundamental influences shape the sensitivity of a landscape to land use type and intensity.

The influences of the geologic setting and associated physical processes on the Plan Area aquatic habitats have been captured by stratifying the landscape into "lithotopo units" ("LTU") (areas of similar lithology and topography) after the general concept of Montgomery (1997). A second level of stratification consists of classifying stream segments of the channel network within each LTU. Since the Plan Area is highly variable with respect to rock type and geologic history, the LTU stratification seems especially well suited for this landscape.

[2] In the future, the Plan Area may be changed by the addition or deletion of properties as further described in Section 12 of this HCP and as specified in the Implementation Agreement ("IA").

Figure 2. Ownership map

Note: this figure is available for viewing as a separate file.

2.2.1 Lithotopo Units

The Plan Area has been divided into five LTUs: (1) Alpine Glacial ("AGL"), (2) Crescent Islands ("CIS"), (3) Crescent Uplands ("CUP"), (4) Recessional Outwash Plain ("ROP"), and (5) Sedimentary Inner Gorges ("SIG") (Figure 3). Geology, geological history, and topographic relief determined lithotopo unit boundaries. The delineation of these areas represents a finer scale stratification of the regional landscape than has previously been proposed (see for example Omernik 1987), and divides the Simpson properties into areas that share similar erosional and channel forming processes. This level of stratification is critical to understanding the productivity of the Plan Area streams, their response to historical logging practices and natural disturbances, their habitat response over time, and their sensitivity to current logging operations.

2.2.1.1 Alpine Glacial

The *Alpine Glacial* LTU (8.5 percent of the Plan Area) is the land west of the divide between the West Fork Satsop River and Schafer Creek and north of Carter Creek, encompassing the Wynoochee River and its tributaries, exclusive of those segments that lie in the CUP. Glacial deposits of gravels, sands, silts, and clays native to the Olympic Mountains are prevalent in this unit. Some of these deposits are highly cemented, and where they occur in stream banks are resistant to erosion, often maintaining a vertical or an undercut slope. Sediment is delivered to channels in this unit through gradual bank erosion and shallow rapid landsliding of accumulated soils on steep side slopes where channels cut through terraces of the ancient Wynoochee River. Channels with connections to steeper headwaters in the CUP receive sediment and wood from catastrophic processes (mass wasting and debris torrents) common to that LTU. In stream segments whose banks are composed of resistant glacial till, recruitment of woody debris from on-site is principally through windthrow or shallow-rapid landslides rather than bank undercutting and channel migration.

2.2.1.2 Crescent Islands

The *Crescent Islands* LTU (11.8 percent of the Plan Area) is the area directly to the south and west of Shelton encompassing the watersheds of Mill Creek above Lake Isabella, Kennedy and Skookum Creeks and parts of Goldsborough, Wildcat and Cloquallum Creeks. Principal topographic features of this unit are the basalt "islands" around and between which flow low gradient, gravel rich stream systems. These islands were overridden by the continental ice sheets as evidenced by the glacial drift overlying their slopes. The thickness of these non-native deposits thins with increasing elevation. Recessional melt pathways were established through this area as the glacial meltwater flowed initially to the south, exiting through the Chehalis River and Grays Harbor. Significant deposits of unconsolidated sand and gravel characterize present day channel banks and lower terraces. The ample supply of foreign granitic gravels makes these low gradient channels excellent spawning habitat for chum salmon, and their low gradient pool riffle channel bed morphology makes them very productive for coho salmon. However, the unconsolidated character of their stream banks makes them susceptible to inputs of fine sediments through bank erosion. Large woody debris is recruited relatively quickly along moderate to large channels through bank undercutting and channel migration.

Figure 3. Lithotopo units

Note: this figure is available for viewing as a separate file.

2.2.1.3 Crescent Uplands

The *Crescent Uplands* LTU (10.7 percent of the Plan Area) is an area of the southern Olympic foothills composed of massive basalt and breccia rock types. This unit runs across the northern tier of Simpson's ownership and also encompasses portions of the adjoining USFS lands. The headwaters of Bingham, Dry Bed, and Rabbit Creeks are in this unit, as are Vance Creek, the South Fork of the Skokomish River and its tributaries, the headwaters of the Middle and West Forks of the Satsop River, and parts of the upper Wynoochee River and its tributaries. The dominant sediment delivery processes in this unit are debris torrents and shallow rapid landslides. The CUP landscape is highly dissected, resulting in high drainage density and a high degree of connectivity between the logging road system and the channel network. Woody debris recruits to the channel mainly through catastrophic processes with some addition of individual trees or small groups from localized streamside slope failures. These catastrophic log recruitment processes, in combination with the highly confined channels, can result in large valley logjams. Runoff patterns tend to be rapid due to the shallow nature of soils and underlying bedrock. Much of this LTU lies at elevations that make the occurrence of rain on snow ("ROS") events more likely.

2.2.1.4 Recessional Outwash Plain

The *Recessional Outwash Plain* LTU (44.9 percent of the Plan Area) encompasses the extensive area of low relief extending from Mason Lake, north and east of Shelton, to the area west of Shelton, south of the CUP, and east of the SIG. This unit was formed by repeated advances of continental ice sheets and resultant recessional outwash during the Pleistocene period. Its soils are rich in sediments (stratified gravels, sands, silts and clays) foreign to the Olympic Peninsula. Channels flowing across this unit have flat slopes and abundant gravel deposits stored in the channel bed and banks. For streams originating on the ROP, sediment and wood are only delivered via localized bank undercutting as no channel connection to steep headwater areas exists. In some parts of this unit, infiltration of rain is affected by impermeable glacial tills and as a result stream stage may rise and fall quickly in response to winter storms in spite of their otherwise low energy regime. In more southerly areas and especially to the west and along the Olympic Mountain front, channels are prone to intermittency. Ground water sources maintain strong flow in other major tributaries of the ROP (e.g. Stillwater River, Bingham and Decker Creeks).

2.2.1.5 Sedimentary Inner Gorges

The *Sedimentary Inner Gorges* LTU (24.1 percent of the Plan Area) comprises the area to the west of the divide between Decker Creek and the Middle Fork of the Satsop River and the divide between the Schafer and the West Fork of the Satsop River and south of the CUP. This unit extends south into Satsop River tributaries (Cook Creek) and cuts west in the Carter Creek basin south of the contact with the Olympic glacial outwash. Marine siltstones, mudstones, and sandstone characterize the lithology of the SIG. Soils are deep and highly erodible and the channel network is deeply incised. The entrenched nature of the channel network is the dominant characteristic of streams in this unit. Significant sediment delivery processes in this unit include massive deep-seated landslides of many ages, inner gorge side slope failures, (especially in the mudstone and siltstone reaches of the channel network), and shallow rapid failures of the channel side slopes in the sandstone channel segments. A unique feature of the bedrock in this unit is the unusually high rate of weathering as a result of desiccation and exfoliation in the summer and calving of side slopes from freezing and thawing and fluvial erosion in the winter. Woody debris recruits to the channel network in this unit catastrophically through side slope failures in the inner gorges and deep-seated landslides. Single tree recruitment as a result of bank recession also is a significant contributor of wood to the channel system from lower floodplains and terraces where they occur within inner gorge settings. The deep soils and weathered bedrock of this unit retain water well resulting in many small perennial channels.

2.2.2 Stream Classification Systems

Regulators and physical scientists have developed numerous schemes to classify channels. In the Pacific Northwest the primary purpose for most of these systems has been to create a management framework for the application of riparian rules and regulations. These systems all have some basis in physical science, but they have largely been driven by arbitrary distinctions such as the presence or absence of salmonid fishes. Consequently regulatory focus and management guidelines have been established based on site level attributes rather than watershed and reach level processes. Recent work in this area has described entire channel networks from a process perspective (Montgomery and Buffington 1997). These new approaches have opened the way for the development of more sophisticated classification schemes that explicitly acknowledge the longitudinal and hillslope connections within channel networks in forested landscapes.

2.2.2.1 Washington Forest Practices Stream Types

The Washington State Forest Practices Act has 6 stream types (1, 2, 3, 4, 5, and 9). Type 9 is the designation for non-typed stream segments. These stream segments often occur at the tip of the channel network and field verification usually determines them to be Type 4 or 5. Stream Types 1-3 have fish, Types 4 and 5 do not. Simpson has identified 1,394 miles of stream in the Plan Area, all segments of which have a DNR stream type assigned to them in Simpson’s geographic information system (“GIS”). Stream types have been verified through the latest data available (Quinault Indian Nation and Simpson Timber Co. unpublished data).

2.2.2.2 HCP Channel Classification Scheme

The approach to stream classification adopted by the HCP principally follows the process-based approach of Montgomery and Buffington (1997) and borrows from the Washington State Watershed Analysis method by grouping channel segments of similar confinement into what could loosely be referred to as “physical response classes.” However, the HCP approach differs in that it explicitly addresses geology (and therefore the character of bed and bank materials) through stratification by LTU. The purpose of classifying the channel network is to facilitate the following four activities: (1) grouping channel segments by dominant physical processes and ecological roles, (2) assigning riparian strategies that reflect important riparian forest functions in different landscape settings, (3) mapping biological resources through Simpson’s GIS, and (4) facilitating the allocation of channel assessment and monitoring resources.

Channel width, the degree of channel confinement, and channel bed morphology were used to classify each channel segment. Field surveys were conducted to identify the basic channel classes and then each segment was assigned a class through the GIS using a combination of the following variables: DNR stream type, geology, LTU, and channel slope. The GIS stream segment database has over 8,200 records, each one identifying a separate segment. Channel class names are constructed of the LTU acronym followed by alphanumeric characters. The letters indicate the lithology (C = Crescent formation basalt, L = Lincoln formation siltstones and mudstones, M = Montesano formation sandstone, Qa = alluvial sediments, Qc = deposits of continental glaciers, and Qo = deposits of Olympic alpine glaciers) and the number refers to the relative basin area typical of the channel class, however no direct correspondence exists between the number and channel order as described by Strahler (1957). After the initial class assignments were made, maps were produced on which corrections were made based on field familiarity with the area and additional field verifications. This process resulted in 49 different channel classes for the Plan Area. Mileage for each channel class and the percentage of the class by DNR stream type is listed below in Table 3.

Even though many of these size/confinement/bed morphology classes may occur in multiple LTUs, the LTU helps describe physical channel processes and ecological roles. Since these conditions represent very different conservation opportunities, these channels are assigned a different channel class. For example, in the CUP there are *small, highly confined, forced step pool channels*. In the SIG *small, highly confined, forced step pool channels* also exist. However, the physical response to management in these channels and the ecological roles they fill are very different due to their occurrence in different geology, topography, elevation and hydrologic zones.

Simpson's channel classification approach facilitates the mapping of the biological communities in the Plan Area. In this way it is a practical tool for describing the motivation behind the conservation approaches and prescriptions. Some of the biological associations are very strong. For example the SIG-L4 channel segments are important for steelhead spawning and rearing. They are also virtually the only segments that support riverine breeding western toads. Similarly the CUP-C1 channel class is the principal habitat of the Olympic torrent salamander while SIG-L2 channels often support isolated (above waterfalls) populations of riffle sculpin. The channel classification system also provides a convenient framework for assigning riparian prescriptions, evaluating riparian forest functions, managing stream habitat data, and understanding the longitudinal linkages in the channel network.

2.3 BIOLOGICAL CONTEXT

2.3.1 Aquatic Species

Attached as Appendix A are brief descriptions of the habitat requirements and distribution in the Plan Area for the 30 aquatic dependent species covered by the Plan. Species have been grouped by “associations” that represent groups of species occupying similar reach or segment levels of the channel network. This grouping facilitates the association of species with such landscape features as the dominant hillslope and channel processes that are associated with different reaches of the channel network and as such provides insight into the formative processes for their habitats. Since management prescriptions are targeted at forest management activities that often upset the natural balances of these processes the grouping also establishes a linkage between species associations and management prescriptions. Similar microhabitats of the same channel class may be used by members of a species association for completion of different life history requirements. For example, in some of the mainstem rivers of the Plan Area, western toads use the same slackwater habitat for breeding as juvenile steelhead and coho during the colonization phase of their early stream residence. These habitats are created by the same physical processes and support several species but in different ways.

2.3.2 Wildlife Species

Appendix A also includes brief descriptions of habitat requirements and surveys conducted within the Plan Area for wildlife species addressed by this HCP (Table 2).

Table 3. Miles of each channel class by current DNR stream type.

			DNR Stream Type (miles)					
Channel Class	**Class Character**	**Class Miles**	**1**	**2**	**3**	**4**	**5**	**9**
AGL-Qa6	Lg, UC, PR	12.7	12.5	0.2	0.0	0.0	0.0	0.0
AGL-Qo1	Sm, HC, SP_f/SP	61.3	0.0	0.5	10.4	7.6	24.6	18.2
AGL-Qo2	Sm, MC-UC, PR_f	22.5	0.0	0.0	7.9	3.5	3.7	7.4
AGL-Qo3	Sm, HC, PR_f/SP_f	7.3	0.0	0.4	2.5	2.0	0.4	2.0
AGL-Qo4	Md, UC, PR_f /PB	2.6	0.0	0.0	0.0	1.6	0.0	1.1
AGL-Qo5	Md, HC, PR_f	8.8	0.0	0.9	7.4	0.4	0.0	0.0
AGL-Qo6	Md, HC-MC, PR_f/PB	13.6	1.2	7.4	5.0	0.0	0.0	0.0
AGL-Qo7	Lg, HC, PR/PB	3.7	3.1	0.0	0.6	0.0	0.0	0.0
AGL-Qo8	Lg, HC, SP/PB	5.2	5.2	0.0	0.0	0.0	0.0	0.0
CIS-C1	Sm, HC, SP_f	83.9	0.0	0.0	5.0	2.8	24.4	51.7
CIS-C5	Md, MC-UC, PR_f/PB	1.7	0.6	0.0	1.1	0.0	0.0	0.0
CIS-Qc1	Sm, HC, SP_f	33.3	0.0	0.0	1.0	1.5	8.8	22.1
CIS-Qc2	Sm, MC-UC, PR_f	28.0	0.4	0.1	8.5	3.0	4.4	11.6
CIS-Qc3	Md, UC, PR_f/PR	16.8	6.3	9.7	0.8	0.0	0.0	0.0
CUP-C1	Sm, HC, Cas/BD	199.9	0.0	0.0	1.7	55.6	74.1	68.6
CUP-C2	Sm, HC, SP/Cas	22.9	0.0	0.0	3.3	17.6	2.0	0.0
CUP-C3	Sm, HC, SP_f/SP	24.5	0.0	0.4	11.2	10.6	2.1	0.3
CUP-C4	Md, HC, SP/BD	4.9	0.5	0.1	4.2	0.1	0.0	0.0
CUP-C5	Md, MC, SP_f/PB	3.5	0.6	0.1	2.8	0.0	0.0	0.0
CUP-C6	Md, HC, SP/PB	3.6	2.8	0.0	0.1	0.6	0.1	0.0
CUP-C8	Lg, HC, SP/PB	5.9	5.9	0.0	0.0	0.0	0.0	0.0
ROP-C7	Md, UC, BR/PB/PR_f	9.4	0.0	1.0	7.8	0.2	0.0	0.5
ROP-Qa7	Lg, UC, BR	3.7	3.7	0.0	0.0	0.0	0.0	0.0
ROP-Qc1	Sm, UC, PR_f	167.3	0.0	2.4	33.9	32.5	36.7	61.8
ROP-Qc2	Sm, HC, PR_f /SP_f	103.4	0.0	0.1	8.4	14.4	21.3	59.2
ROP-Qc3	Md, UC, PR_f/PR	44.2	18.8	13.4	11.8	0.0	0.0	0.3
ROP-Qc4	Md, HC, PB/PR_f	9.1	0.8	1.1	7.2	0.0	0.0	0.0
ROP-Qc5	Md, HC, PB/PR_f	12.1	10.8	1.3	0.0	0.0	0.0	0.0
ROP-Qc6	Md, UC, PR	9.5	9.3	0.2	0.0	0.0	0.0	0.0
ROP-Qc7	Lg, MC, PR/BR	15.2	14.1	0.0	1.1	0.0	0.0	0.0
ROP-Qc8	Lg, MC, PR/PB	2.8	2.8	0.0	0.0	0.0	0.0	0.0
SIG-L1	Sm, HC, SP_f	160.0	0.0	0.0	8.0	6.5	57.7	87.8
SIG-L2	Sm, MC,PR_f/PR	38.5	0.0	0.3	15.3	8.2	6.2	8.5
SIG-L3	Md, HC, SP_f/BD	6.3	0.0	0.5	5.0	0.7	0.2	0.0
SIG-L4	Lg, HC, PR/PB	24.2	22.8	1.5	0.0	0.0	0.0	0.0
SIG-M1	Sm, HC, SP_f	67.8	0.0	0.0	3.9	4.8	33.3	25.8
SIG-M2	Sm, MC, PR_f	18.5	0.0	0.0	7.7	4.9	4.1	1.8
SIG-M3	Md, HC, BD /PR_f	9.6	0.0	0.0	7.2	1.8	0.6	0.0
SIG-M4	Md, MC, BD/PR_f	6.0	1.1	1.4	3.5	0.0	0.0	0.0
SIG-M5	Lg, HC, PR/PB	15.1	15.1	0.0	0.0	0.0	0.0	0.0
SIG-M6	Md, UC, PR	2.3	0.0	0.9	1.4	0.1	0.0	0.0
SIG-Qa6	Lg, UC, PR	11.3	11.3	0.0	0.0	0.0	0.0	0.0
SIG-Qc1	Sm, HC, SP_f	12.8	0.0	0.0	1.7	2.4	6.6	2.1
SIG-Qc2	Sm, MC-UC, PR_f	8.9	0.0	0.0	3.2	0.4	3.3	2.0
SIG-Qc3	Md, MC-UC, PR_f	9.1	1.2	1.1	6.2	0.0	0.0	0.5
SIG-Qo1	Sm, HC, SP_f/SP	38.3	0.0	0.0	2.6	5.7	16.7	13.3
SIG-Qo2	Sm, MC-UC, PR_f	19.0	0.0	0.0	10.3	4.4	3.0	1.4
SIG-Qo3	Md, HC, PR_f/SP_f	4.8	0.0	0.0	4.7	0.2	0.0	0.0
SIG-Qo4	Md, MC, PR_f/PB	2.0	0.0	0.0	2.0	0.0	0.0	0.0
Totals		**1397.8**	150.8	45.0	226.3	193.8	334.1	447.9

3 MANAGEMENT AND REGULATORY CONTEXT FOR THE HCP

3.1 MANAGEMENT ACTIVITIES ADJACENT TO THE PLAN AREA

Simpson's HCP is only one of several management, planning, and regulatory tools governing forest practices in southern Olympic Peninsula, Washington. Washington State has adopted Forest Practice Rules identifying "Best Management Practices" ("BMPs") required for forest practices within the State. These BMPs are generally applicable to all forest operations. In addition, both Port Blakely Tree Farms, L.P. and the Washington State Department of Natural Resources have prepared habitat conservation plans governing harvests on forestlands in the vicinity of this HCP. The forestlands immediately to the north of Simpson's Plan Area are owned and managed by the USFS in accordance with the "1994 Northwest Forest Plan". The longitudinal connections via the major north-south trending river valleys provide substantive physical interactions and habitat connectivity between the Federal properties and the Plan Area.

This HCP generally consists of a contiguous block of Simpson land surrounded by a matrix of lands owned by federal, state, tribes, large timber companies and small private landowners. Figure 2 identifies these ownerships and their juxtaposition to the Plan Area. Any assessment of the impact of Simpson's proposed management activities on fish and wildlife in the Plan Area must be made in the context of a broader analysis of the impacts resulting from this mosaic of ownership and land management practices. The following provides a general overview of the land ownership pattern and their percentage of total lands within five miles of the HCP boundary.

Northern Boundary: Olympic National Forest (95%); City of Tacoma (3%); small landowners (2%).
Western Boundary: Weyerhaeuser (32%); Rayonier (30%); John Hancock Mutual Life Insurance (15%); Olympic National Forest (10%); City of Aberdeen (5%); Port Blakely Tree Farms L.P. (3%); Mason County (2%); small landowners (2%); and Washington State Department of Fish and Wildlife (1%).
Southern Boundary: Weyerhaeuser (35%); Washington State Department of Natural Resources (25%); Port Blakely Tree Farms L.P. (20%); and small landowners (20%).
Eastern Boundary: Small landowners (95%); and Skokomish Tribe (5%).

3.2 MANAGEMENT DESCRIPTION

The following are brief descriptions of management practices implemented by the primary landowners adjacent to the Plan Area.

3.2.1 Olympic National Forest

The Hood Canal Ranger District of Olympic National Forest (ONF) makes up a majority of the land ownership adjoining the HCP northern boundary. A majority of that land was clearcut harvested from 1973 to 1985, and those lands currently consist of timber stands approximately 10-20 years of age. Some relatively small blocks and corridors (less than 200 acres) of old-age forests (greater than 100 years old) are present in the Canyon, Satsop and Wynoochee River drainages. Currently about 40% of the South Fork Skokomish basin is either old-age forest or alpine vegetation. The following identifies and describes the future management proposed for the ONF.

In connection with management of these lands, Simpson has recently commenced litigation against the United States of America in the United States Court of Federal Claims under Case No. 00-198C and in the United States District Court for the Western District of Washington at Tacoma under Case No. C00-

5207-RJB. In the action pending in Federal District Court, Simpson has asked the court for an order compelling specific performance of the Cooperative Agreement for the Management of the Participating Forest Properties in the Shelton Cooperative Sustained Yield Unit entered into between Simpson and the United States in 1946. Should this case result in certain actions that would alter the land allocations and management described below, this would be considered a changed circumstance and certain provisions of this HCP could be changed as outlined in Appendix F.

3.2.1.1 Land Management Allocations

There are two Land Management Allocations on ONF lands, within ten miles of the HCP boundary: Adaptive Management Areas (AMA) and Late-seral Reserves (LSR) (Figure 4).

Adaptive Management Areas (AMA) AMAs consist of approximately 60 percent of the ONF lands within ten miles of the HCP northern boundary. Land management in AMAs is directed at developing and testing innovative approaches to forest stand and landscape level management while also working towards ecological and economic objectives. Management in these areas includes developing or restoring forest and stream habitat complexity by using silvicultural practices, such as long harvest rotations and partial retention.

Late-Seral Reserves (LSRs) - LSRs consist of approximately 40 percent of the ONF lands within ten miles of the HCP northern boundary. Management in these areas protects and enhances old-growth and other late-successional forest communities. Most forest harvest actions are restricted from these lands, although some forest thinning and limited road building may occur.

3.2.1.2 Key Watersheds

Four Key Watersheds have also been identified by the ONF in areas within ten miles of the northern HCP boundary: Wynoochee, West Fork Satsop, Canyon River and South Fork Skokomish River. These watersheds have: 1) habitat for potentially threatened species or stocks of anadromous salmonids or other threatened fish; or 2) greater than six square miles with high-quality water and fish habitat. Some Simpson lands are included within the Wynoochee and South Fork Skokomish Key Watersheds due to the high level of concern for water quality and native fish (Figure 4). These private land inclusions are advisory only, and they do not carry regulatory restrictions for private landowners.

Key Watersheds are not a land management allocation. However, management within these areas must be directed at meeting the nine Aquatic Conservation Strategy (ACS) principles, as defined in the Northwest Forest Plan (USDA and USDI 1994).

Those principles are:

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of aquatic systems to which species, populations and communities are uniquely adapted.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections including flood plains, wetlands, upslope areas headwater tributaries, and intact refugia.

3. Maintain and restore the physical integrity of aquatic systems, including shorelines, banks, and bottom configurations.

4. Maintain and restore water quality necessary to support healthy riparian, aquatic and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals comprising aquatic and riparian communities.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements include timing, volume, rate, and character of sediment input, storage and transport.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak high and low flows must be protected.

7. Maintain and restore the timing, variability, and duration of flood plain inundation and water table elevation in meadows and wetlands.

8. Maintain and restore species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, channel migration, and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

3.2.1.3 Watershed Restoration

The Forest Service South Fork Skokomish Watershed Analysis Team has identified many watershed restoration projects. This team found approximately 2,500 management-related erosion features (600 mass wasting and 1,900 surface erosion) in the watershed, and 85 to 90 percent of these are road related. Since 1991 the Hood Canal Ranger District has been actively involved with watershed restoration projects on Forest Service lands in the South Fork Skokomish watershed, primarily in the following drainages: LeBar Creek; Brown Creek; Vance Creek and Rock Creek. The District has completed 150 miles of road decommissioning, which included: removing unstable landings and sidecast materials; removing culverts; reestablishing stream channels; installing cross ditches; and modifying road beds to resemble original contours. They also have completed 80 miles of road stabilization, which included removing unstable landings and side cast material; modifying road prisms to resemble the original contours; and planting trees, shrubs and grasses on those sites. The District also has stabilized approximately 1,250 acres of unstable slopes by using a variety of techniques including revegetating, installing fiber matting and terracing slopes. The Hood Canal District has proposed further projects in the Cedar and Vance Creek drainages, which consist of 34 miles of road decommissioning; 39 miles of road stabilization, 250 acres of soil bioengineering; and planting approximately 70,000 trees. The District has also proposed decommissioning 2.9 miles of roads in the Wynoochee River drainage.

3.2.1.4 Critical Habitat

In addition to the above management categories, critical habitat has been proposed or designated for two federally listed species by the USFWS within the region. Portions of ONF immediately north of the Plan Area have been designated as critical habitat for the northern spotted owl and marbled murrelet. Critical habitat for both species generally follows LSR boundaries with some minor differences.

Figure 4. Olympic National Forest land management designations.

Note: this figure is available for viewing as a separate file.

3.2.2 Timber Companies

A large portion of lands adjacent to the western and southern boundaries of the Plan Area are owned and managed by three large timber companies: Port Blakely Tree Farms, L.P., Weyerhaeuser, and Rayonier Timberlands Operating Company. Weyerhaeuser and Rayonier manage a majority of their forestlands with 40-60 year clearcut harvest rotations and even-age reforestation. Port Blakely manages their lands in much the same manner; however, they have longer harvest rotations of 70-80 years for some of their stands.

Port Blakely obtained a Section 10 ESA HCP for approximately 7,500 acres of the Robert B. Eddy Tree farm, located approximately 18 miles south of the Plan Area. The Port Blakely HCP covers 7 amphibian, 16 bird, and 9 mammal species, in addition to an unlisted species agreement covering other wildlife species that may become listed in the future.

Under Port Blakely's HCP, they will harvest approximately 6,386 acres of mature second growth. In addition, approximately 2,000 acres will be commercially thinned and about 70 percent of planted third-growth stands will be commercially thinned. Port Blakely will apply silvicultural prescriptions in the form of commercial thinning and wildlife leave-tree retention to maintain and develop wildlife habitats over the life of the plan. They will thin some forests to accelerate development of characteristics associated with late-successional habitats. In addition, the rate-of-harvest will be a variable rotation length to develop and maintain a wider range of successional stages across the Plan Area. Currently most of the tree farm is in 50-60 year old stands which will be converted to a more even distribution of stands 20-50 years old by the end of the plan period.

3.2.3 Washington Department of Natural Resources

The Washington Department of Natural Resources (DNR) is trustee of 2.1 million acres of forestlands in Washington. A portion of those lands are within ten miles of the southwestern corner of the Plan Area, within the Capitol State Forest. These lands and most other DNR forest lands are managed under a Section 10 ESA HCP issued in 1997. DNR's HCP management addresses all species currently listed: the northern spotted owl, marbled murrelet, grizzly bear, gray wolf, Aleutian Canada Goose, Columbian white-tailed deer, bald eagle, peregrine falcon, and Oregon silverspot butterfly. DNR's management includes provisions to protect murrelet habitat, spotted owl habitat, riparian corridors and special habitat types such as caves, talus fields, and large, structurally unique trees and snags.

3.2.4 Small Private Landowners

Small landowners within ten miles of the Plan Area implement a wide range of forest and land management practices. A majority of these lands are managed with clearcut harvest and even-aged regeneration silviculture. A small percentage of these lands are managed with selective tree harvest or, in some cases, forest retention/conservation, particularly where forests are desired for residential areas. In general, these small landowners have not implemented conservation plans; however, they are obligated to follow relevant State forest practices regulations. Washington State Forest Practice rules identify BMPs required for forest practices within the state, and these BMPs are generally applicable to all forest operations on private lands. In addition, a matrix of small (typically less than 80 acres) private landowners are interspersed within the Plan Area. These small parcels of private lands consist of small farms, residential areas, and forest lands. These forestlands also are managed according to Washington State Forest Practice Regulations.

3.2.5 City of Aberdeen Watershed

The City of Aberdeen owns a small portion of land within the Aberdeen Watershed adjoining the northwestern portion of the Plan Area. This watershed also incorporates approximately 1,500 acres of Simpson lands. Simpson manages its lands in the watershed in a manner that is consistent with the City of Aberdeen watershed needs. City of Aberdeen and Simpson representatives work together to arrive at agreeable management approaches to: road construction; road maintenance and use; timing of timber harvest; and road access. The management prescriptions outlined in Section 5 of this Plan are not inconsistent with the terms of the Aberdeen agreement.

3.2.6 Tribal Lands

The Skokomish and Squaxin Indian Reservations are located within the Plan Area. These lands are set aside for the exclusive use and benefit of Indian peoples pursuant to treaties, statutes, and executive orders. These reservations are governed by sovereign tribal governments, which have the right to regulate resources within their reservations, including fish and wildlife species. The Skokomish Tribe has some lands adjoining the northeastern portion of the Plan Area, and some of those lands are managed with clearcut silviculture and even-aged reforestation.

3.2.7 City of Tacoma

The City of Tacoma operates two hydroelectric facilities within 1-2 miles of the HCP boundary. The Wynoochee Reservoir is located near the northwestern corner of the Plan Area and the Cushman Reservoir is located near the northeastern corner of the Plan Area. Both of these hydroelectric projects have lake drawdown periods. The Wynoochee project diverts water from the stream system approximately 2,500 feet from the dam to the power plant tailrace. The Cushman project diverts flows from the North Fork Skokomish River through a 2.5-mile tunnel that empties into Hood Canal immediately below the Cushman power plant. Both of these dams were constructed without fish passage structures. Mitigation measures including the trucking of fish from below the Wynoochee Dam and release into the upper reservoir allows for some anadromous fish migration. Negotiations are ongoing between the Skokomish Tribe, City of Tacoma, and the Federal Energy Regulatory Commission (FERC) involving the North Fork Skokomish River minimum flow standards and mitigation for impacts resulting from those hydroelectric facilities.

3.2.8 Olympic National Park

One of the largest landowners on the Olympic Peninsula is the Olympic National Park, located in the interior of the Olympic Peninsula (within ten miles of the Plan Area). On its lands, the National Park Service is mandated to "conserve the scenery and natural and historic objects and the wildlife therein, and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." The National Park Service is mandated to promote the conservation of all federally listed threatened, endangered, or candidate species within the park or their critical habitats. Conservation of species and habitats within ONP plays a significant role in the sustainability of many wildlife and fish populations in the Olympic Peninsula Region.

3.3 RELATIONSHIP OF THE HABITAT CONSERVATION PLAN TO THE CLEAN WATER ACT

The prescriptions outlined in this Habitat Conservation Plan serve to address issues and concerns related to the Clean Water Act (CWA). To that end EPA and the Washington State Department of Ecology (DOE) have prepared a draft TMDL technical assessment report to address CWA concerns (attached to this document as Appendix G). These include ensuring compliance with State of Washington water quality standards. Water quality standards include numeric criteria, narrative criteria, characteristic uses and State antidegradation provisions. These standards are established at levels to ensure that a given waterbody (streams, lakes, wetlands, marine areas, etc.) supports its existing and designated characteristic uses. Uses may include but are not limited to: water supply; stock watering; salmonid migration, rearing, and harvesting; wildlife habitat; recreation; and commerce and navigation. Numeric limits are set for pollutants such as temperature, fine sediment and toxics while narrative criteria are established to protect against diminishment of aquatic habitat suitability for salmonids.

It is the intent of the conservation program outlined in this HCP to address water quality concerns in two ways: 1) improve water quality in areas where it currently is in poor condition due to management related causes, and 2) maintain water quality in areas where it currently is in good condition through application of protective management strategies.

(1) 303(d) Listed Water Bodies - The CWA requires that water quality problems be identified where they occur. Simpson plans to initiate actions to understand the cause and effect relationships and promote recovery of elevated temperatures on the three stream segments currently listed on the State's 303d list of impaired water bodies. As outlined in the following sections, a monitoring plan will be developed to track the status and trends of stream temperatures and the effectiveness of recovery efforts.

(2) Anti-degradation - The CWA also requires that water quality standards include appropriate provisions to prevent additional, incremental damage to water quality and aquatic resources. This "anti-degradation" standard may be achieved by development and compliance with best management practices or related actions that are demonstrably effective in altering stream or watershed processes that control the expression of water quality. Simpson has developed a set of proposed forestry management practices (described in Section 5) that are keyed to the particular characteristics of their diverse landscape, and address the most probable mechanism that may place public resources at risk. These proposed practices go beyond current forest practices, and as such, present a more reliable basis for protection of current and future water quality and water resource integrity.

The ultimate effectiveness of Simpson's management prescriptions and the level and timeliness of plan implementation will be tracked through an ongoing provision for monitoring associated with this HCP. Information resulting from this monitoring program will provide the necessary feedback, at pre-defined points, to judge the adequacy of the plan, as a means of implementing the TMDL, and may be used to trigger changes (through adaptive management, see Section 10) in prescribed management actions.

3.4 CONTRIBUTION OF THE HCP TO REGIONAL SPECIES CONSERVATION

3.4.1 Listed Species

3.4.1.1 Chinook Salmon (Puget Sound ESU)

This ESU is inclusive of all Hood Canal and Puget Sound rivers and independent tributaries, including some in the eastern Strait of Juan de Fuca. Of streams within the Plan Area, the Skokomish River has always been the largest contributor and continues in that role today, although most of the production from the Skokomish is now of hatchery origin. The smaller tributary streams of Totten and Skookum Inlets and Oakland Bay historically were never more than a very small percentage of the overall ESU production and today, after decades of hatchery management in South Puget Sound and resultant poor wild escapements, can only be described as a minor remnant. The role of Plan Area streams in the recovery of this ESU must be considered a minor one based on the impacts of previous management and the relatively small production potential relative to the entire ESU. Locally, however, Plan Area streams represent dispersed production within the ESU and may be culturally valued for Tribal fishing. No special characteristics of runs in this ESU are documented for Plan Area streams and production is not remarkable from any other biological perspective.

3.4.1.2 Chum Salmon (Hood Canal Summer Run ESU)

The Hood Canal summer chum ESU is comprised of many small-population segments from the rivers and independent tributaries of Hood Canal. Production of summer chum occurs in the lower ends of streams in the ESU because the fish arrive on relatively low flows in the early fall. Most of the production of summer chum in the South Fork Skokomish River is expected to occur downstream of the Plan Area. Plan Area activities have been conditioned to minimize downstream sediment effects. The Plan Area channel network will support recovery of this ESU principally through the production generated from the mainstem of the South Fork Skokomish River and any of its lower tributaries that may provide suitable habitat. This contribution will be roughly proportional to the occurrence of the habitat distribution within the ESU and is otherwise unremarkable.

3.4.1.3 Bull trout (Coastal Washington and Puget Sound population segment)

It is unlikely that the Plan Area will make a significant contribution to regional conservation or recovery of bull trout due to the restricted nature of their distribution in the Plan Area and the character of Plan Area streams. The principal aggregations of bull trout that connect to Plan Area channels are in the mainstem South Fork Skokomish River and the anadromous segments of its major tributaries (USFS unpublished data 1998). Little information exists that would pertain to the upper reaches of the Wynoochee and the several forks of the Satsop River, but data collected by the same team of USFS personnel did not find this species in surveys done in these segments.

Electrofishing surveys conducted by Simpson in small headwater streams indicate no presence of bull trout above anadromous blockages. These surveys did document coastal cutthroat trout and riffle sculpin. It does not appear that bull trout exist in isolation above waterfalls in the Plan Area. This conclusion coincides with the results of the USFS surveys related above. Regional conservation of bull trout will primarily be supported by river segments in the upper South Fork Skokomish and the North Fork Skokomish above Lake Cushman. In both cases, habitat comes under substantial protection of the USFS and the ONP.

3.4.1.4 Marbled Murrelet

The Washington, Oregon, and California marbled murrelet population segment was federally listed as threatened in September 1992 due to the substantial loss and modification of nesting (older forest) habitat and mortality from net fisheries and oil spills (USFWS 1997). This species had been identified by the USFWS as a recovery priority 3 species with high degree of threat and high recovery potential. The interim objective of the 1997 marbled murrelet recovery plan is to stabilize population size at or near current levels by: (1) maintaining and/or increasing productivity of the population as reflected by changes in total population size, the adult: juvenile ratio, and nesting success by maintaining and/or increasing marine and terrestrial habitat; and by (2) removing and/or minimizing threats to survivorship, including mortality from gill-net fisheries and oil spills (USFWS 1997).

The Plan Area currently has approximately 1,138 acres of highly fragmented habitat that potentially may be used by murrelets for nesting. Although this habitat is highly fragmented, some of it could provide a small but valuable contribution to the Pacific Northwest murrelet recovery goals.

3.4.1.5 Bald Eagle

The Pacific Bald Eagle Recovery Plan was developed in 1986 to help guide restoration efforts in Washington and six other states. Goals of this recovery plan included: 1) a minimum of 800 nesting pairs; 2) average reproductive rate of 1.0 fledged young per pair, with a nesting success rate per occupied site of not less than 65 percent; 3) attainment of breeding population goals in at least 80 percent of the management zones; and 4) stable or increasing wintering populations.

Bald eagles have nested in the Plan Area in the past and some winter communal roosting has occurred at one site. This type of use provides a valuable, albeit small, contribution to the overall conservation of this species recovery in the Pacific Northwest.

3.4.2 Species Proposed for Listing

3.4.2.1 Coastal Cutthroat trout (Southwestern Washington / Columbia River ESU)

Coastal cutthroat trout use a variety of habitat types and have an especially diverse repertoire of life histories. Consequently they are widespread within the Plan Area and occur in the smallest of perennial streams, a variety of wetland types and larger mainstems of appropriate character. The Plan Area will contribute significantly to the regional conservation of this species because Plan Area aquatic habitat is so diverse and the species apparently is adapted to use nearly all these different habitat types. Both overall numbers and life history diversity will be preserved and benefited by their use of the Plan Area. The Stillwater River is of especially high importance to this species and lies in the core of the Plan Area. Local residents report that this particular population segment has been especially hard hit by illegal nighttime bait fishing. However, the freshwater habitat is in excellent condition and should remain so under HCP management. Some native resident populations occur in the Plan Area above bedrock cascades and waterfalls and represent a small but valuable diversity in the regional conservation context.

3.4.3 Candidate Species for Listing

3.4.3.1 Coho Salmon (Puget Sound / Straight of Georgia ESU)

Plan Area streams represent a very small contribution for the conservation of this ESU, however locally they are capable of providing a dispersed production component. Harvest and hatchery management in the past has led to relatively poor wild coho returns to the independent tributaries that constitute the principal Plan Area production opportunity. However, habitat in these low gradient tributaries appears to be capable of producing coho in good numbers provided the escapement is satisfactory. No remarkable stock characteristics have been identified for runs in the Plan Area and it is unlikely that the aquatic habitat potential is any greater than its occurrence in the overall habitat base for the ESU.

3.4.3.2 Coho Salmon (Lower Columbia River / Southwest Washington ESU)

The Plan Area can contribute significantly but not uniformly to conservation of this coho ESU. The West and Middle Fork Satsop Rivers and the Canyon River do not have a significant tributary network within the Plan Area for the production of coho salmon and their mainstems are not particularly conducive because of relatively severe confinement within inner gorges of SIG LTU. The Wynoochee River and several of its larger tributaries and the East Fork of the Satsop River system including the Stillwater branch are the primary coho production areas in the Plan Area for this ESU. These streams are as efficient as any at producing coho in the region and can form the core of a coho strong hold in the southern Olympics. Even though there has been significant hatchery intervention in the ESU in the past, the Satsop River maintains a relatively large and late running stock that is somewhat unique in an otherwise homogeneous group of coastal coho.

3.4.3.3 Pacific lamprey

Pacific lamprey are widely distributed along the coast of North America and breed in freshwater. The ammocoetes live in silt deposits of back eddies along river margins and migrate to the ocean between ages 4-6 where they are parasitic on fish. Plan Area mainstem rivers provide spawning and rearing habitat, as do all other coastal rivers. Nothing remarkable about the Plan Area would suggest a particular value over other areas in the region for this species.

3.4.3.4 River lamprey

River lamprey are widely distributed along the coast of North America and breed in freshwater, having a life history similar to the Pacific lamprey. They are also parasitic on fish as adults in the marine environment. Plan Area mainstem rivers provide spawning and rearing habitat, as do all other coastal rivers. Nothing remarkable about the Plan Area would suggest a particular value over other areas in the region for this species.

3.4.4 Unlisted Species (no ESA petition or determined unwarranted after status review complete)

3.4.4.1 Chinook salmon (Pacific Coast ESU)

Mainstem rivers and their larger tributaries support spawning by chinook salmon but there is nothing out of the ordinary about individuals occupying the Plan Area. The Plan Area will contribute to the regional conservation of this species proportionate to the habitat available to them. Nothing unique or remarkable exists about them with perhaps the exception of spring chinook on the Wynoochee and the South Fork Skokomish Rivers. These two runs may have been relatively small historically and have been all but extirpated today. The dam has affected the run in the Wynoochee and the run in the south Fork Skokomish began declining in the late 1950's from unknown causes. The Plan Area potentially could support relatively unique runs in these two areas when the limiting factors that have been responsible for their decline are eliminated.

3.4.4.2 Chum salmon (Pacific Coast ESU)

The East Fork Satsop River and its tributaries could make a significant contribution to the coastal chum ESU. Productive side-channel, tributary and mainstem habitats within the Plan Area are especially favorable. However, other factors such as run timing and body size are not remarkable and contribute nothing out of the ordinary to the ESU.

3.4.4.3 Cutthroat trout (Puget Sound ESU)

The small independent tributaries of the Plan Area in this ESU could make a solid contribution to regional conservation of the species but are not especially noteworthy. Habitat in these tributaries is somewhat less complex and there are fewer interconnecting wetlands than in the Stillwater/ East Fork Satsop systems.

Consequently the life histories that are likely to be encountered may not be as variable as those in some other Plan Area streams. Their worth will be proportional to their occurrence in the ESU.

3.4.4.4 Dolly varden

The contribution of the Plan Area to Dolly varden conservation will be minimal. There does not appear to be any distribution within the smaller tributary network comprising the bulk of channel miles and only in the South Fork Skokomish River do there appear to be very many native char.

3.4.4.5 Pink salmon (Odd year ESU)

Pink salmon were never widespread in the Plan Area and it is unlikely that they will ever be a common species again. Populations in the Skokomish basin were apparently fairly significant at one time but have been depressed since the 1950's. Regional conservation will be primarily supported by tributaries of Hood Canal and Puget Sound substantially to the north of the Plan Area.

3.4.4.6 Steelhead trout (Washington Coast ESU)

Steelhead trout are supported by mainstem rivers and the larger tributaries of many Plan Area streams. The West Fork Satsop River has a relatively large bodied and late running wild run that represents a reasonably different and important local stock. Aside from that run, Plan Area streams and stocks are not noteworthy or remarkable.

3.4.4.7 Steelhead trout (Puget Sound ESU)

Nothing unique or remarkable about the fish or the habitat exists for steelhead in this ESU in the Plan Area. The contribution of Plan Area streams to steelhead production in this ESU may only be especially distinguished by the South Fork Skokomish River, which has excellent habitat above the canyon, and in the North Fork above its confluence with the South Fork. Production has been reasonably strong in these areas in the recent past and is expected to continue under HCP management.

3.4.4.8 Torrent salamander

The Olympic torrent salamander is known only from the Olympic Peninsula, the genus having been split into four distinct groups in 1992. The Plan Area lies at the southern edge of the northernmost group of these seep salamanders. This species occurs only in the small steep colluvial tributaries of the upper channel network and does not appear to exist outside the CUP in the Plan Area. The Plan Area is complementary in its support of this animal as the bulk of the range exists in the Olympic National Park where no management of its forest and stream habitat will occur.

3.4.4.9 Tailed frog

Tailed frog occur from southern British Columbia to northern California on the Pacific Coast, in the Cascades of Washington and Oregon and in the Blue Mountains of Oregon and further into Idaho and Montana. This species does not occur continuously across the Plan Area and several streams in the CIS support this species. These populations are isolated from the other more commonly occurring populations in the CUP and northern SIG and AGL and may represent unique relict populations between the Olympic foothills and the Black Hills to the south. Aside from these populations the Plan Area does not appear to represent a unique conservation opportunity for this species.

3.4.4.10 Cope's giant salamander

Cope's giant salamanders occur in southern British Columbia, throughout the Olympic Peninsula and southwest Washington and into northern Oregon. In the Plan Area they are broadly distributed with the highest densities occurring in small headwater streams of the CUP and the AGL. This species is the most cosmopolitan of the stream breeding amphibians and the Plan Area only represents one of many relatively common conservation opportunities within the species range.

3.4.4.11 Western redback salamander

Western redback salamander occur from southern British Columbia to southern Oregon and west to the Cascade crest. In the Plan Area they occur with regularity in all LTUs and are common in riparian settings under rotting wood and in loose talus. There is nothing special about individuals in the Plan Area that is remarkable and the Plan Area is only one of many forested opportunities for the conservation of this species.

3.4.4.12 Shorthead sculpin

The shorthead sculpin typically occurs at higher elevations than any of the other cottid species. In the Plan Areas it has a very limited distribution in some headwater streams of the CUP and the AGL. Due to its limited distribution in the Plan Area there is only a minor conservation opportunity. The populations in the Plan Area probably represent the southern most on the Olympic Peninsula and may be of interest in that context but are not otherwise remarkable.

3.4.4.13 Van Dyke's salamander

Van Dyke's salamanders have a distribution that is split into three parts, the Olympic Peninsula, the Willapa Hills and the southern Cascades of Washington. It is relatively uncommon in the Plan Area and only the northern most edge of the Plan Area is within its range. The Plan Area represents a small but significant opportunity for conservation of the species southern range on the Olympic Peninsula.

3.4.4.14 Riffle sculpin

The riffle sculpin occurs in a wide variety of coastal streams in Washington, Oregon and northern California. In the Plan Area this species is distributed in all LTUs and across a variety of habitat types even occurring as isolated populations above waterfalls. Isolated sculpin populations are not unique to the Plan Area but do represent locally interesting occurrences. This is the only remarkable feature of riffle sculpin in the Plan Area.

3.4.4.15 Coast range sculpin

The coast range sculpin occurs from southern California to the Aleutian Islands. There is nothing remarkable or unique about Plan Area populations or their habitat.

3.4.4.16 Reticulate sculpin

The reticulate sculpin occurs from southern Oregon to northern Puget Sound. There is nothing remarkable or unique about Plan Area populations or their habitat.

3.4.4.17 Speckled dace

The speckled dace is found west of the continental divide in North America and is common in Washington state. It is found more in tributaries and sometimes in riverine ponds and wetland channel segments than the longnose dace, which prefers the larger rivers. The Plan Area is not remarkable in the regional conservation context for this species.

3.4.4.18 Brook lamprey

The brook lamprey is widely distributed along the coast of North America and is found inland up the Columbia River to the lower Yakima River. It spends its entire life in freshwater and can be found in a number of low gradient channel classes in the Plan Area. Our surveys have documented its occurrence above waterfalls and bedrock cascades and it appears to be most common in the SIG. However, based on its widespread distribution there does not seem to be anything particularly remarkable or noteworthy about populations in the Plan Area. The streams of the SIG are rich in fine sediments that appear to be excellent habitat for this species and may represent an above average conservation opportunity.

3.4.4.19 Torrent sculpin

Torrent sculpin are found north into British Columbia from the mid Oregon coast and interior to northwestern Montana. This species prefers larger swifter streams and is common in such habitats throughout the Plan Area. From a regional conservation perspective there is nothing remarkable about populations or individuals in the Plan Area.

3.4.4.20 Longnose dace

Longnose dace are widely distributed in North America. In the Plan Area they are found in the mainstem rivers where the juveniles are found in late summer in shallow open habitats along the river margin. The adults show a preference for fast riffle habitats. Aside from these observations little is known about their use of the Plan Area but nothing in the literature suggests the Plan Area would be of exceptional value to their conservation.

3.4.4.21 Western toad

The western toad has disappeared from many of its previous breeding localities in the Puget Sound area. Several riverine breeding populations occur in the Plan Area and appear to be strong and may be relatively unique in their occurrence and breeding phenology. The populations in the Plan Area are an important group of animals and constitute a unique regional conservation opportunity for this species.

3.4.4.22 Prickly sculpin

The prickly sculpin is distributed broadly along the coast of North America. Although there is some variation in appearance and taxonomic traits over its range there is nothing remarkable about Plan Area individuals. The distribution of this species in the Plan Area is restricted to some wetlands and low velocity, sluggish streams and does not represent a unique or disproportionately important regional conservation opportunity.

3.4.4.23 Olympic mudminnow

The Olympic mudminnow is regionally important because it only occurs on the Olympic Peninsula. The Plan Area populations occur in isolated wetlands or sluggish streams with considerable aquatic vegetation and a muck substrate. The occurrence of this species in the Plan Area represents an important segment of an otherwise limited range.

3.4.4.24 Threespine stickleback

The threespine stickleback is a widely distributed fish and tolerates both marine and freshwater environments. In the Plan Area it is found in wetlands and sluggish streams and is sometimes found in isolated wetlands that have only intermittent connections to the channel network. This species shows considerable phenotypic variation across its range and the populations of the Plan Area are of interest but unknown importance owing to their isolation. However, Plan Area populations are not critical to regional conservation of this species.

3.4.4.25 Northwestern salamander

Northwestern salamanders exist west of the Cascade Mountains from western British Columbia to northern California. This species requires lentic habitat for breeding which makes the wetland complexes of the Plan Area an especially valuable regional conservation asset; however, no remarkable traits of this species are represented by individuals in the Plan Area.

3.4.4.26 Long-toed salamander

Long-toed salamander are broadly distributed throughout the region extending from southeast Alaska into northern California and west to Montana. Two subspecies exist and the Plan Area supports the one representative of the country to the west of the Cascade Mountains. This species requires lentic habitat for breeding which makes the wetland complexes of the Plan Area an especially valuable regional conservation asset; however, no remarkable traits of this species are represented by individuals in the Plan Area.

3.4.4.27 Red-legged frog

The red-legged frog occurs from southwestern British Columbia into northern California and as far upstream in the Columbia Basin as the White Salmon River. This species is nearly ubiquitous in the Plan Area and is quite abundant. There is nothing about the Plan Area population segment that is remarkable but the relatively high density of wetlands in the Plan Area provide an excellent anchor for the mid-latitudes of this species range.

3.4.4.28 Harlequin Duck

Harlequin ducks use large and medium sized, fast flowing rivers in the Plan Area for breeding, nesting and rearing of young from April to September of each year. Harlequin duck populations in the Puget Sound Basin, and Western Washington as a whole, appear to be healthy and stable, whereas populations east of Washington have declined during recent years (refer to Appendix A for further details). The Plan Area contains some high quality river ecosystems used by this species for reproduction. Continued availability of that high quality habitat will contribute to sustaining a healthy harlequin population in Western Washington.

3.4.4.29 Band-tailed Pigeon

Annual censuses of the band-tailed pigeons in Western Washington have shown that this population has significantly declined during at least the last 10 years (refer to Appendix A for further details). This decline is possibly due to a combination of the following factors: 1) winter habitat loss and degradation; 2) spring/summer habitat loss and degradation; and 3) over hunting. At this time it is difficult to tell how much of a contribution the Plan Area provides to the conservation of this species; however, the Plan Area is known to support at least a small portion of this population.

3.4.4.30 Roosevelt Elk

Roosevelt elk populations in the Plan Area, and in western Washington, are not at this time in jeopardy and the population appears to be viable over the long-term. Additionally, this species is not considered a federal species of concern, and the WDFW has identified it as a game species. However, within the Plan Area, the management of this species is of concern due to: (1) populations below ecological carrying capacity and possibly below harvestable carrying capacity; (2) the species is important to Tribes for hunting; and (3) the species is important to the public for hunting. This HCP will help maintain and potentially increase the existing populations of Roosevelt elk in the Plan Area.

3.4.4.31 Snag Dependent Bird Species

The HCP addresses 15 bird species (Table 2) that rely on snags for nesting, and some of those species rely on snags as sources of forage. These species currently are not federally listed, although five species have been identified as Washington State Species of Concern or Monitor Species (western bluebird, purple martin, Pileated woodpecker, wood duck and common merganser). A majority of the low elevation forests in western Washington have been harvested at least once, and these forestlands generally have lower quantity and quality of snags for these snag species as compared with historical levels. However, the Plan Area, along with neighboring forest lands, may contribute to the overall long-term survival of these populations in western Washington.

4 RESOURCE GOALS AND OBJECTIVES

The term "resource objectives or biological objectives" has been used in landscape and conservation planning processes to describe objective criteria that can be used to judge the success of the plan in meeting its stated purpose. In this general context, the term has been used to identify specific resources such as the condition or amount of particular habitat types, or even the distribution or density of animals of a particular species. Discussions about the utility of different objectives and their units of measure continue within management and regulatory circles. The purpose of this Section is to build a specific context for using the term "resource objectives" in this Plan, thereby avoiding any confusion on the subject that may be caused by more general external references.

4.1 "PRESCRIPTION" VERSUS "OUTCOME" BASED CONSERVATION PLANNING

A lack of specific biological objectives in some HCPs has been a cause for criticism of the habitat conservation planning process (e.g. see Kareiva et. al. 1999). This concern has led some to make a distinction between plans that are considered "prescription" versus "outcome" based. Recent changes in USFWS policies on HCPs seek to address this point. *Prescription based* plans assume that the management prescriptions implemented by the plan will accomplish the goals or objectives and make no explicit commitment to adjust practices should this not bear out. Perhaps more importantly, could be the lack of a commitment to monitor the outcome so that the results might never be known. *Outcome based* plans on the other hand explicitly identify measurable resource objectives (sometimes referred to as performance standards or targets) and also make allowances for adjustments to the prescriptions based on information to be obtained through monitoring. In an outcome based plan, if monitoring indicates the resource objectives have not been met within a specified time frame, management prescriptions are adjusted until the desired result is achieved. This process has come to be known as "adaptive management" (Holling 1978, Lee 1993). Consequently it has been argued that a plan which commits only to implementing the management prescriptions provides less certainty in the protection of biological resources, and falls short of the fundamental expectations of adaptive management and desired outcomes of the ESA.

Conversely, an outcome based plan will provide a landowner with little or no regulatory stability. In effect, the landowner is asked to do whatever it takes at whatever the cost to achieve preset desired outcomes. Since securing "regulatory stability" is often a landowner's primary goal in entering into an HCP, a strict outcome based approach may result in few, if any, landowners willing to proceed with an HCP. This is particularly true since an outcome based approach often suffers from insufficient scientific knowledge to set the "targets" with certainty. Moreover, the ultimate desired outcomes, i.e. enhanced populations of fish or other animals, will often be determined by factors beyond the control of any landowner. No matter what the landowner does and how much it spends the "target" may not be achievable.

Simpson's HCP attempts to steer a middle course between these two approaches. While it identifies measurable resource objectives and a monitoring program to track the outcome of management prescriptions, it caps its obligation to make adjustments to the initial set of prescriptions in terms of limits on the incurrence of additional costs and contributions of additional land. Simpson fully expects that the resource objectives will be achieved through implementation of the initial management prescriptions and that the outcome will be determined through monitoring. However, allowances have been made for adjusting the prescriptions as information becomes available through the monitoring program. Limitations on adjustments to the prescriptions are fully described in Section 10, Adaptive Management.

4.2 DESIRABLE ATTRIBUTES OF RESOURCE OBJECTIVES

Although the concept of setting "hard wired" resource objectives to judge success or trigger adjustments in management prescriptions is seductively simple, its execution in the world of industrial forestry, spanning a spatially and temporally variable landscape, is not. If the resource objectives are based on misguided assumptions or unrealistic expectations of how forested watersheds and channel networks function, they will frustrate land managers and resource advocates alike. Since most of the resources of the monitoring and research program of this HCP will be directed toward determining the status of the resource objectives, their measurement must provide not only information on the true condition and expected trends of the resources, but also on the efficacy of the management prescriptions.

There are some fundamental differences between how resource objectives can be set between terrestrial and aquatic systems. In mature terrestrial landscapes habitat is changing slowly (with the exception of catastrophic fires and wind storms), while riverine systems, because of the dynamic nature of flowing water, are constantly changing to local and distant inputs of wood, water, and sediment. In addition, the impacts of covered activities on terrestrial systems are direct (e.g. all the trees are cut down), while the impacts of covered activities on aquatic systems are almost always indirect through alteration of the character or quantity of watershed inputs. Therefore the units that are used to define terrestrial resource objectives may be quite different from those used for aquatic habitats (e.g. number of acres of forested habitat preserved or the number of snags present per unit area of remaining forest).

Aquatic resource objectives should lie as far up the chain of physical or ecological *cause and effect* as possible (i.e. physically or relationally close to source area material inputs). Unless this is done, it may be impossible to associate observed conditions with causes because cumulative effects or legacy effects of past practices may obscure proximate relationships. Ideally the resource objectives should be described in a currency that operates as an early warning system of impending ecosystem damage rather than an after the fact confirmation of unintended consequence or undesirable change. Moreover, information gained from monitoring the status of resource objectives must be capable of discriminating between unintelligible variance around a variable and a real signal of adverse change. For example, making assumptions about the ideal number of pools, their spacing and depth, or about the ideal number of pieces of large woody debris – and applying these "targets" in a blanket fashion to streams across the landscape, will do little to reflect inherent versus induced variability, nor address what factors are responsible for the present conditions.

4.3 THE CASE FOR ALTERNATIVE RESOURCE OBJECTIVES

Considerable knowledge about how watersheds function in forested landscapes of the Pacific Northwest has been accumulated over the last two decades (Naiman and Bilby 1998). Watersheds and channel networks are highly variable, responding to random and highly improbable natural disturbance events that operate on overlapping scales of space and time. These patterns make prediction of habitat condition at any given point in time or space very problematic. Therefore, the very nature of aquatic and riparian systems renders them incompatible with the traditional "engineering standards" model of evaluation based on narrow tolerances of condition or state. Nevertheless there remains a legitimate need to set some kind of standard to reinforce the traditional approach to resource protection that is based only on implementation of best management practices ("BMPs").

4.3.1 Animal Distribution or Density

Perhaps the most problematic resource objective from Simpson's position is one that would be cast in terms of animal distribution or density. Depending on the particular species, many factors outside

Simpson's control and in fact outside the Plan Area strongly influence the distribution and density of aquatic vertebrates and indeed some terrestrial wildlife species. Perhaps the most extreme example of this situation is that of animals that migrate great distances. For example, the inter-annual abundance of adult Pacific salmon is controlled by multiple fisheries, natural marine predators, and variable ocean productivity, all of which operate entirely outside Simpson's sphere of influence. A resource objective constructed around the number of adult spawners would do little to measure the adequacy of Simpson's management prescriptions.

The density of fry and smolts in freshwater are likewise not useful because they are a function of complicated stock productivity relationships that include parent stock size, numerous habitat factors, and inter-annual variation of regional and local weather. Our ability to actually enumerate juveniles is imperfect, as is our ability to determine survival to specific life history stages such as egg to fry survival. For all these reasons the distribution and density of aquatic vertebrates are problematic units of measurement for resource objectives. For some terrestrial wildlife species that have relatively small home ranges, whose distribution within the Plan Area is known and whose habitat requirements are reasonably well-described, some measure of distribution or relative abundance may be more appropriate. However, even in these cases there remain questions about how competition or predation may affect density or distribution within a community context.

4.3.2 In-channel Conditions

A partial, but inadequate, solution to the standards dilemma is the application or comparison of reference conditions from unmanaged streams to similar managed settings (Peterson et. al. 1992, Woodsmith and Buffington 1996). Inherent variability in the expression of common instream habitat variables (such as residual pool depths, size and distribution of large wood debris) even in unmanaged wilderness streams confounds our ability to establish firm "target" values (Ralph et al. 1994, Rhodes et al. 1994, McCullough et al. 1996, Bauer and Ralph 1999). This approach tends to require the application of such a large range of values that it becomes difficult to establish compliance or deviance from the reference standard.

However, used in concert with local knowledge about upslope and riparian conditions, in-channel indices do provide a useful suite of interpretive variables. The combined information may be used to strengthen an understanding of likely trends of aquatic habitat condition as long as they are viewed in the proper longitudinal and watershed context. This latter role may be fulfilled by implementing a stream habitat assessment program to collect these data for use with a more focused monitoring program directed at upslope and riparian conditions near the source of the watershed inputs.

4.3.3 Watershed Inputs

The wealth of new information about riverine systems has led to some major paradigm shifts about their management that represent substantial challenges to our contemporary framework of water resource protection and our regulatory institutions (Magnusun et. al. 1996). The most significant of these changes is a shift away from trying to protect aquatic habitats with reach or site level conditioning of land use activities, to a focus on protection of aquatic habitats through management of watershed and channel network processes (Montgomery et. al., 1995). These processes are the "engines" that drive the expression of instream and riparian conditions that define the stream's productive capacity in any given year. This logic suggests that while in-channel indicators of habitat condition, (such as pool spacing, pool depth, wood loading, or the fraction of streambed gravels constituted by sands and fines), may be somewhat useful in describing current habitat conditions, they provide little insight into the adequacy of current management prescriptions or likely future conditions. Since Simpson is primarily interested in these latter two issues, the aquatic resource objectives must be cast in terms and units that are capable of providing insight into these issues.

4.4 PLAN AREA AQUATIC GOAL

The primary habitat goal of Simpson's HCP is to *conserve and develop intact, ecologically connected and naturally functioning aquatic ecosystems*. Aquatic systems with these three characteristics will be complex and have the capacity for self-organization, which are hallmarks of healthy ecosystems (Norton 1992). The aquatic resource objectives then should relate to natural functions and processes of watersheds and channel networks and their ecological connectivity.

4.4.1 Plan Area Aquatic Resource Objectives

To achieve these conditions it is necessary to reduce the occurrence of management related disturbances across the landscape and create watershed conditions that will enable natural disturbance processes to create habitat. To assist in focusing the management prescriptions and the research and monitoring program four broad resource objectives were set that apply to the entire Plan Area.

1. Conserve and develop riparian forests consistent with the natural plant potential and disturbance regimes of riparian settings.

2. Maintain basin level hydrologic processes consistent with a naturally functioning landscape.

3. Control sediment inputs to the channel network to levels consistent with naturally functioning valley and hill slopes.

4. Maintain surface water temperatures consistent with a naturally functioning landscape.

4.4.2 LTU Specific Aquatic Resource Objectives

Since forest management activities impact the landscape of each LTU differently, each of the Plan Area resource objectives assumes different significance in each LTU. For example, with regard to objective number two, maintaining basin level hydrologic processes, the principal hydrologic management issue in the CUP is rain-on-snow events triggered by rapid snow melt; in the AGL, it is interception of shallow subsurface flow by roads; while in the SIG it is transfer of water by the road system between small catchments. Therefore we have found it not only desirable, but also necessary, to establish LTU-specific resource objectives in order to strategically focus our forest management prescriptions and the monitoring and research program.

Typically resource objectives are considered to be time and space specific and quantitative. Where possible we have identified them in these terms, but in most cases the monitoring and research program will inform this process as much as any *a priori* standards could. For example, while resource objective No. 2 for the AGL (Section 4.4.2.1) may not be time specific and does not have a "quantitative" target or standard associated with it, it clearly states a management intent about an important character of intact, ecologically connected, and naturally functioning stream systems. Based on this resource objective, the research and monitoring program (see Monitoring Question No. 6, Section 9.4.2.1) will investigate this condition, describing the extent and degree of the problem in the AGL, its likely past causes, and potential remedies and risks associated with each. This approach contrasts with the more speculative and "non-adaptive" application of quantitative standards applied to components, rather than processes, of the stream system. This latter approach would miss the really important long-term issues, continuing to focus on symptoms, never understanding and addressing the underlying cause that prevents full expression of aquatic habitat quality. Therefore, as long as the research and monitoring program is designed to refine our understanding of an objective and put it into a practical context for the Plan Area, the lack of time specificity and quantitative targets is not necessarily a weakness.

However, in the absence of time and space specificity and quantitative standards, the question may be raised: "How will it be determined when or even if the objective has been met?" The answer lies in the results of the integrated monitoring and research program (Section 9). In the case of less specific aquatic resource objectives, it will be necessary to derive information from multiple assessment, monitoring and/or research activities to evaluate whether an objective has been met. This task is not more difficult nor the conclusion less certain than in the case of hard targets; it simply requires a more integrated and holistic treatment of information and must be planned for in the early stages of the monitoring program.

Take for example LTU Specific Objective No. 7, "manage sediment supply, storage, and transport from the CUP landscape consistent with normal landscape and hillslope function." A number of pieces of information will be required including: estimates of the background rate of landslides and an understanding of their processes and triggering mechanisms, systematic landslide inventories, an assessment of channel sediment storage capacity and the functional linkages to riparian forests including woody debris inputs, some measurement of the sediment supply or transport signal from the canyon systems into downstream segments at the Olympic mountain front (perhaps best monitored by permanently monumented cross sections located to detect long term changes in bed elevation). Additional variables could be added that might enhance data interpretation such as the coincidental measurement of sediment grain size that is both in storage behind debris dams in the highly confined channel network of the CUP and the material that arrives at monitored cross sections beyond the mountain front. The final analysis in determining whether the objective has been met will rely on the results and trends associated with all these data.

Simpson has identified fourteen LTU-specific aquatic resource objectives in these particular landscapes. A much longer list of objectives could have been compiled. However, at this time Simpson has limited the list to objectives that have special significance because they are themselves critical or through their attainment, achieve others by default. Because objectives with obvious application to broad landscapes only are listed for one LTU, it does not mean it will be overlooked in the others, it simply means it does not have special emphasis in the other LTUs. For example, CIS resource objective No. 5 is important everywhere but in the CIS it is especially important because of highly deformable channel beds composed of unconsolidated sands and fine gravels which are common in the CIS. Conclusions regarding selection of the resource objectives were reached based on Simpson's stream assessment and monitoring program, three completed state of Washington watershed analyses, and several ad hoc projects conducted for the HCP.

The following LTU or channel class specific objectives further define and support the greater Plan Area aquatic objectives based on the particular characteristics of the LTU or channel class and habitat requirements of principal species associations present. They form what could be considered important subsets of the Plan Area aquatic resource objectives. These objectives are measurable and form the framework for assessing the effectiveness of Simpson's management prescriptions - separating the performance of current management practices from past practices, historical legacies, and natural variability. The sediment load allocations in Table 4 that were developed in the proposed Plan Area TMDL as described by the Technical Assessment Report (Appendix G) have been designated as resource objectives to provide a quantitative framework for evaluating progress toward the attainment of the TMDL.

4.4.2.1 Alpine Glacial

1. Maintain shallow subsurface flow pathways.

2. Reconnect functionally confined channel segments with their historic floodplains (special reference to the AGL-Qo6 and AGL-Qo7 channel classes).

3. Accelerate the development of coniferous riparian forest stands (special reference to the AGL-Qo4 channel class).

4.4.2.2 Crescent Islands

4. Accelerate the development of coniferous riparian forest stands (special reference to the CIS-Qc2 and CIS-Qc3 channel class).

5. Reconnect stream habitat by replacement or repair of culverts. [It shall be assumed that this objective is met if all stream crossings on fish bearing segments are designed and constructed to allow upstream passage of juvenile salmonids by year 7 of the Plan.]

6. Manage sediment supply and storm flow hydrology consistent with requirements for successful reproduction by large bodied salmonids (special reference to the CIS-Qc3 channel class).

4.4.2.3 Crescent Uplands

7. Manage sediment supply, storage, and transport from the CUP landscape consistent with normal landscape and hillslope function.

8. Manage processes that affect storm flow runoff pathways consistent with a naturally functioning landscape. [It shall be assumed that this objective is met if the duration of the 2 year recurrence interval flow is not increased by more than 25%.]

4.4.2.4 Recessional Outwash Plain

9. Reconnect functionally confined channel segments with their historic floodplains (special reference to the ROP-Qc3 channel class).

10. Eliminate detrimental levels of management-caused temperature increases.

11. Protect and maintain the functional integrity of wetlands.

4.4.2.5 Sedimentary Inner Gorges

12. Increase the extent of alluvial channel cover (over bedrock) in M3 and M4 channel classes. [It shall be assumed that this objective is met if by year 10 of the Plan a 25% increase in cover is observed.]

13. Maintain sediment supply from the SIG-L1, M1, and Qo1 channel classes within ranges consistent with “normal” channel and hillslope function.

14. Maintain mass wasting on inner gorges of channel classes SIG-L4 and M5 consistent with “normal” hill slope function.

4.4.2.6 Channel class sediment loads

Maintain sediment allocations consistent with the following table. Sediment loads are designated by channel class and will be evaluated at appropriate temporal and spatial scales as determined in accordance with Section 9.

Table 4. Sediment load allocations (yd3 / stream mile per year, long term average).

Channel Class	Mass Wasting			Surface Erosion	Floodplain Storage/ Bank Erosion
	SR	DT	LPD		
AGL-Qa6	6	1	10	4	928
AGL-Qo1	6	1	1	4	16
AGL-Qo2	6	1	1	4	8
AGL-Qo3	6	1	5	4	9
AGL-Qo4	6	1	5	4	13
AGL-Qo5	6	1	5	4	12
AGL-Qo6	6	1	5	4	17
AGL-Qo7	6	1	5	4	17
AGL-Qo8	6	1	10	4	22
CIS-C1	1	0	1	2	20
CIS-C5	1	0	1	2	16
CIS-Qc1	1	0	1	2	24
CIS-Qc2	1	0	1	2	8
CIS-Qc3	1	0	1	2	106
CUP-C1	11	7	1	3	21
CUP-C2	30	7	1	3	10
CUP-C3	7	7	1	3	10
CUP-C4	7	7	1	3	24
CUP-C5	11	7	1	3	14
CUP-C6	7	7	1	3	61
CUP-C8	9	7	1	3	31
ROP-C7	1	0	1	1	51
ROP-Qa7	1	0	1	1	5,193
ROP-Qc1	1	0	1	1	2
ROP-Qc2	1	0	1	1	3
ROP-Qc3	1	0	1	1	4
ROP-Qc4	1	0	1	1	4
ROP-Qc5	1	0	1	1	20
ROP-Qc6	1	0	1	1	91
ROP-Qc7	1	0	1	1	104
ROP-Qc8	1	0	1	1	189
SIG-L1	5	1	16	5	19
SIG-L2	5	1	5	5	17
SIG-L3	5	1	5	8	19
SIG-L4	25	1	105	12	95
SIG-M1	5	1	26	5	18
SIG-M2	5	1	20	5	18
SIG-M3	5	1	5	8	19
SIG-M4	13	1	5	8	19
SIG-M5	5	1	240	12	42
SIG-M6	5	1	45	8	230
SIG-Qa6	8	1	225	12	937
SIG-Qc1	5	1	1	5	18
SIG-Qc2	5	1	1	5	18
SIG-Qc3	5	1	35	8	21
SIG-Qo1	5	1	19	5	25
SIG-Qo2	5	1	1	5	18
SIG-Q03	5	1	5	8	21
SIG-Qo4	14	1	5	8	29

4.5 WILDLIFE MANAGEMENT GOALS

Late-successional forests, riparian forests and snag habitat are some of the most limited wildlife habitats on industrial forest lands in western Washington, including the lands within the Plan Area. The overall wildlife resource management goals of this HCP are primarily directed at conserving and developing those natural resources, as well as other habitats for specific species. These goals are:

1. To conserve and develop stream and wetland riparian wildlife habitats and upland habitats adjoining those areas;
2. To conserve and develop late-seral forests in select areas of the Plan Area;
3. To conserve and develop snag habitat, primarily within riparian ecosystems, wetlands and adjacent uplands in the Plan Area; and
4. To implement other conservation prescriptions for specific wildlife species.

4.5.1 Species Specific Resource Objectives

The following resource objectives apply to specific species that are singled out for special reference because of their ESA status or uncertainty about the controls on their distribution and population levels within the Plan Area. In these cases Simpson and the Services deem additional emphasis is appropriate and have established the following species specific measurable standards. These standards are based on one of two general metrics: 1) distribution and/or relative abundance of the animals, or 2) specific habitat parameters.

Bull trout:

The resource objective for bull trout is to maintain or increase the current distribution within the Plan Area. Simpson will inventory for bull trout using methods endorsed by the Services to complete the baseline distribution by year five of the Plan (in accordance with Section 9). Simpson will provide additional inventories to assess distribution in years 10, 20, 30, and 40 and will use the data to evaluate deviations from the baseline. If the baseline distribution has been reduced at these check points, adaptive management discussions will be initiated and actions taken in accordance with Section 10.4.

Stream breeding amphibians: (Olympic torrent salamander, tailed frog, and Cope's giant salamander)

The resource objective for Tailed frog and Cope's giant salamander is to maintain or increase the current distribution and relative abundance within the Plan Area[3]. For the Olympic torrent salamander, the resource objective is to maintain or increase the current distribution only as relative abundance is difficult to establish without destructive sampling. Simpson will survey annually for these species, (in accordance with Section 9) compiling and analyzing data on an ongoing basis. If at any time during the Plan period a significant decline[4] or reduction in range[5] is indicated, adaptive management discussions will be initiated and actions taken in accordance with Section 10.4.

[3] The current distribution and relative abundance of stream breeding amphibians within the Plan Area may be affected by factors outside Simpson's control; questions about apparent regional and global declines of amphibians are still unresolved and could confound local data if not taken into account (Wake 1991, Pechman and Wilbur 1994, Blaustein et. al. 1994). Consequently regional trends will be taken into account when evaluating trends within the Plan Area.

[4] Simpson will conclude that a significant decline in density has occurred if the relative abundance of animals is reduced below baselines established in the monitoring program described in Section 9.

Western toad:

The resource objective for the Western toad is to maintain or increase the current distribution and relative abundance within the Plan Area.[6] Simpson will survey annually for this species, (in accordance with Section 9) compiling and analyzing data on an ongoing basis. If at any time during the Plan period a significant decline [2] or reduction in range[3] is indicated, adaptive management discussions will be initiated and actions taken in accordance with Section 10.4.

Van Dyke's salamander:

The resource objective for the Van Dyke's salamander is to maintain or increase the current distribution within the Plan Area. Simpson will survey periodically for this species, (in accordance with Section 9) and if a reduction in range is indicated at any time during the Plan period, adaptive management discussions will be initiated and actions taken in accordance with Section 10.4.

Snag-dependent bird species:
(Downy woodpecker, black-capped chickadee, red-breasted sapsucker, tree swallow, violet green swallow, hairy woodpecker, western screech owl, northern pygmy owl, whet saw-whet owl, northern flicker, Pileated woodpecker, western bluebird, chestnut-backed chickadee, wood duck and common merganser)

The resource objectives for these species is to provide a minimum average of 2 snags 12-24" DBH and 2 snags > 24" DBH per acre of RCR within each LTU (snags must be at least 20 feet in height). In accordance with Section 9, Simpson will survey for snags in the RCRs and at year 20 and 40 present information sufficient to establish snag density at those checkpoints. If snag densities are lower than these targets at year 20 and year 40, adaptive management discussions will be initiated and actions taken in accordance with Section 10.4.

4.5.2 Other Covered Species

For all other covered species in Table 2 only, the biological objective is to create habitat conditions capable of sustaining or increasing their current populations. In these cases no initial specific animal or habitat based standards are established for the measurement of this objective. However, where deemed appropriate, and subject to other priorities, the SAT may suggest specific distribution or habitat metrics for monitoring with respect to other covered species in Table 2.

---

[5] Simpson will conclude that there has been a significant reduction in range if a species disappears from a channel segment that was occupied prior to HCP management.
[6] The Western toad has suffered significant declines over the last several decades throughout much of its range in western North America (Carey 1993). Regional trends must be taken into account for this species when evaluating trends within the Plan Area.

5 MANAGEMENT PRESCRIPTIONS

5.1 GENERAL

Simpson's conservation program emphasizes the protection and development of riparian forests as a primary strategy for satisfying the requirements of Section 10 of the ESA. This basic riparian forest strategy is supplemented by management prescriptions designed to address wetlands, unstable slopes, road construction, road maintenance and decommissioning, and certain harvest limitations to modulate snow melt runoff. The plan also includes a number of conservation measures developed for the benefit of identified wildlife species using the Plan Area including retention of a minimum number of trees where they are not provided by other conservation practices, the conservation of habitats and nest sites, seasonal and spatial limitations on certain forest practices and road closures in the Plan Area. This suite of management prescriptions is defined in this section, whereas the rationale for these prescriptions is described in Section 6.

Section 12 of the HCP and the IA describe certain criteria surrounding the addition of lands to the Plan Area. All of the management prescriptions and monitoring requirements, including road inventories, prioritization of road projects, and remedial road work as well as any other animal or habitat surveys that apply to the initial Plan Area (except as they may have been modified by adaptive management pursuant to Section 10), will be applicable to any lands that are added. The length of time and budget for accomplishing such tasks with respect to added lands shall be proportional to that required of the initial Plan Area.

The conservation program outlined in the following subsections has been developed by Simpson in discussions with the Services, the Environmental Protection Agency and the Department of Ecology for the State of Washington. The identified prescriptions were designed not only to satisfy the requirements of Section 10 under the Endangered Species Act but also with the expectation that implementation of such prescriptions would be consistent with the non-point source load allocation for thermal and sediment input into waters of the Plan Area to be established by DOE and approved by EPA. While certain review and procedural steps remain to be completed, based upon the correspondence dated June 30, 2000, from Ms. Christine Pysk (EPA) to Ms. Nora Jewett (DOE), Simpson anticipates that load allocations for sediment and thermal input in the Plan Area (the "TMDL") will be approved by EPA in the near future and that such load allocations will be substantially similar to those contained in the proposed Technical Assessment Report (Appendix G). In addition, Simpson anticipates that performance of the prescriptions contained in this HCP will constitute an adequate strategy for the implementation of the TMDL as finally approved. For example, the requirements with respect to the maintenance, repair and construction of roads which Simpson is agreeing to implement not only represent the "minimization" and "mitigation" required by Section 10 of the ESA but are also intended to have the effect of reducing sediment input to adjacent waters to the limits of the allocation anticipated to be established by the TMDL. In addition, the analytical approach described in the proposed TMDL for protecting stream temperatures and reducing sediment input (i.e. evaluating the effectiveness of riparian prescriptions on protection of stream temperature and addressing forest road and hill slope related sediment input sources through management prescriptions) lends further support for the Services' analysis of this Plan and their conclusions that the implementation of the Plan will satisfy the requirements of the ESA. The monitoring program described in Section 9 will provide the required information to test fundamental assumptions and inform Simpson and the federal, state and tribal governments of overall plan performance. As described in Section 10, a process of adaptive management will be used to examine this information and make adjustments to plan prescriptions, within agreed limits, as circumstances warrant.

The following management prescriptions are organized in two categories: (1) prescriptions that address a wide range of habitat types and multiple species; and (2) additional prescriptions that address specific wildlife species. These prescriptions will be applied by Simpson in the Plan Area for the duration of the plan except to the extent modified by the application of principles of adaptive management pursuant to Section 10 of this HCP or unless otherwise modified in accordance with the terms of the IA.

This Section does not contain an explanation or rationale for the management prescriptions nor does it set forth the benefits that are expected to accrue from their implementation. This omission is intentional. The document is organized to gather all prescriptions in a single section. The reviewer is directed to Section 6 for the correlative discussion of rationale. (The subsections in Section 6 are organized in a parallel fashion such that each subsection in Section 5 has a counterpart in Section 6 that specifically addresses the rationale of the identified prescription.)

5.2 PRESCRIPTIONS THAT ADDRESS MULTIPLE SPECIES

5.2.1 Riparian Conservation Reserve

Simpson will:

Establish riparian conservation reserves ("RCRs") in accordance with the following:

(a) RCRs boundaries shall be established on all channel segments in the Plan Area in accordance with prescriptions specified for each channel class in Appendix B, Table 25, Table 26 and Table 27. RCR boundaries will generally be established as shown in Figure 5. The exact boundary locations of the RCRs and the LFRs shown in Figure 5 are approximate and the final boundaries will be determined in the field according to the riparian functional boundary (Appendix B, Table 26 and Table 27, Section 5.2.3) and unstable slope boundary (Section 5.2.5).

(b) Management activities inside the RCR will be restricted to those specified in prescriptions in Appendix B, Table 26 and Table 27 as applicable for each channel segment. None of these prescriptions shall preclude yarding corridors identified in Appendix B or road crossings that are consistent with Section 5.2.4.

(c) No salvage of standing dead or downed trees will be permitted in the RCR, described in Appendix B, Table 26 and Table 27, Section 5.2.3 and Section 5.2.5.

5.2.2 Supplemental Wildlife Tree Conservation Program

Simpson will:

(a) Establish a wildlife tree conservation program that supplements trees retained for the Riparian Management Program (5.2.1), the Wetlands Conservation Program (5.2.3), and the Unstable Slopes Management Program (5.2.5) to ensure that the number of trees remaining throughout the Plan Area averages at least 8 trees per acre per section, and that no point within any timber unit harvested after the date on which the ITP is first issued shall be more than 800 feet from trees conserved by the: 1) Riparian Conservation Reserves (Section 5.2.1); 2) Supplemental Wildlife Tree Conservation Program (Section 5.2.2); 3) Wetland Conservation Program (Section 5.2.3); and 4) Unstable Slopes Management Program (Section 5.2.5).

(b) Leave certain trees as habitat or potential habitat for wildlife species in accordance with the following:
- Leave a minimum of eight trees (a minimum of 30 feet in height) per acre of harvest.
- A minimum of four of the eight trees will be selected from the dominant or co-dominant trees within the applicable timber harvest units.
- The other four trees may be any one or a combination of the following:

  - Cedar, hemlock, or other conifer with a live crown (7" minimum DBH).
  - Residual old growth.
  - Safe snags.
- Trees may be dead, dying, or green leave trees.
- Trees left in wetlands, riparian areas or on unstable slopes as a result of the riparian, wetland, or unstable slopes prescriptions will count towards the eight trees per acre.
- Trees may be clumped or dispersed within harvest units.

(c) The Supplemental Wildlife Tree Conservation Program will apply only in those sections highlighted in Figure 6.

(d) Prohibit the salvage of any residual "old-growth" downed wood or stumps throughout the entire Plan Area. In this context "old growth downed wood" is defined as any portion of a tree bole remaining from forest stands that existed prior to mechanized timber harvest.

(e) Leave at least 2 downed logs with a small end diameter greater than or equal to 12 inches and a length greater than or equal to 20 feet or equivalent volume for each acre harvested throughout the entire Plan Area. Old growth logs referenced in (d) above shall not count towards this requirement.

5.2.3 Wetlands Conservation Program

5.2.3.1 Wetlands Classification and Inventory

Simpson will:

(a) Complete an inventory and classification of all wetlands in the Plan Area within ten years of the issuance of the initial ITP; in classifying wetlands, Simpson will adopt the "hydrogeomorphic" ("HGM") approach for classifying wetlands that is currently used in the wetland functional assessment developed by the Department of Ecology for the State of Washington and will further stratify the wetlands based on "Cowardin" vegetation classes (see Glossary for definition of HGM approach and Cowardin vegetation classes).

(b) For each timber harvest unit which is to be harvested prior to the completion of the wetlands inventory and classification described in 5.2.3.1(a) above, inventory and classify any wetlands by hydrogeomorphic and vegetation characteristics at the time of Simpson's internal "timber harvest unit evaluation" for such unit.

(c) Complete a "local" watershed boundary delineation for all wetlands in the ROP within ten years after the issuance of the initial ITP for use in evaluating the effects of roads on wetland hydrology and establishing connectivity for fish distribution.

(d) Complete an evaluation of the existing road system to assess influences on the hydrologic integrity (including water quality) of all wetlands within the Plan Area within ten years after the issuance of the initial ITP.

(e) Establish a network of reference wetlands for the purpose of monitoring the spread of invasive exotic vegetation in wetland complexes. Such work will be a part of the habitat monitoring program and will be prioritized in accordance with overall commitments of that program.

Figure 5. Riparian Conservation Reserves

Note: this figure is available for viewing as a separate file.

Figure 6. Leave tree density and supplemental wildlife tree conservation sections
Areas shaded red are where the "Supplemental Wildlife Tree Conservation Program" (5.2.2) will apply.

Note: this figure is available for viewing as a separate file.

5.2.3.2 Wetlands Protection

Simpson will:

(a) Conduct certain remedial road work for the benefit of wetlands as provided in Section 5.2.4.2 below.

(b) Apply the "no-harvest" management prescription described below to all forested wetlands that are either (i) riverine wetlands or (ii) wetlands associated with unstable slopes and greater than one acre in size. (In all cases, logging and road building activity on unstable slopes shall be controlled by Section 5.2.5 of this Plan). "Forested wetlands" are wetlands whose tree canopy cover exceeds 30%.

(c) At Simpson's sole option apply either the "no-harvest" or the "50%-stem removal" management prescriptions described below to all forested wetlands greater than one acre in size in the Depressional HGM Class associated with a permanent or seasonal hydro-period; for purposes of this prescription, wetlands associated with permanent or seasonal hydro-periods are wetlands with standing water during at least one continuous month during the growing season.

(d) At Simpson's sole option apply either the "no-harvest", the "50%-stem removal", or the "compensating cut" management prescriptions described below to all other forested wetlands greater than one acre in size.

(e) Maintain buffers adjacent to non-forested wetlands in accordance with the following Table 5; as used in such table, references to "no harvest" and "50%-stem removal" management prescriptions are intended to be references to such prescriptions as described below. No buffers will be maintained for forested wetlands except as may result from the application of other management prescriptions such as the establishment of RCRs adjacent to channel segments or non-forested wetlands.

(f) As limited and set forth above, manage forested wetlands and wetland buffers in accordance with one of three prescriptions: "no-harvest", "50%-stem removal" or "compensating cut" management prescriptions:

- A no-harvest prescription precludes all timber harvest in any wetland or wetland buffer managed in accordance with this prescription other than timber harvest incidental to the construction of roads or yarding corridors.
- A 50%-stem removal prescription requires Simpson to leave in each forested wetland or wetland buffer managed in accordance with this prescription a number of trees roughly equivalent to the number of trees harvested from such forested wetland or wetland buffer. The trees left will have statistically similar size and species characteristics to the characteristics of the trees removed from such forested wetland or wetland buffer.
- A compensating cut prescription requires Simpson to identify compensating acres of forested wetlands which are or will be made subject to a no-harvest management prescription for the balance of the term of the Plan to compensate for the acres of forested wetlands being harvested in the wetland subject to this prescription. The compensating acreage will be identified in accordance with the following procedures:
  - At the time of any harvest of a wetland subject to a compensating cut prescription, Simpson will make a record of the acreage of wetlands so harvested and the size, density, and species of the harvested timber.
  - Periodically, but not less frequently than every three (3) years, Simpson will designate a comparable number of acres of forested wetlands in each LTU as being subject to a no-

harvest prescription for the balance of the term of the Plan. The acres so designated will contain timber statistically similar in size, density, and species characteristics to the timber previously harvested from wetlands in each LTU for which such compensation is being provided. Any such comparable acres of forested wetlands may be designated as compensating acres provided that no harvest of timber (including harvest under a 50%-stem removal prescription) has occurred on such acreage since the date on which the initial ITP was issued.

– The acres designated as subject to a no-harvest prescription will be so identified on Simpson's GIS for the balance of the term of the Plan. Maps of such protected forested wetlands will be provided to the Services through the Implementation Monitoring Program (Section 8).

- The attached Table 5 summarizes the management prescriptions applicable to different forested wetlands and wetland buffers.

(g) When non-forested wetlands of any HGM class occur as a mosaic of small wetlands (i.e. the width of the matrix land between wetland features is less than twice the buffer width for their HGM class) the entire area will be managed as a "wetland complex" in accordance with the following:

- A perimeter buffer based on the most restrictive HGM class present in the complex will be established (see Table 5).
- Management of matrix land shall be subject to restrictions set forth in Table 5 for adjacent wetland features in the complex.
- Only those matrix lands that qualify as forested wetlands may be designated as no-harvest RCR compensating acres in accordance with requirements and provisions of 5.2.3.2(f) above.

(h) Ensure that any use of ground based logging equipment in and around forested wetlands does not result in sediment delivery to public resources.

Table 5. Management prescriptions for wetlands and bogs[7] in the Plan Area.

HGM Class	HGM Sub-class	Vegetation Class	Size	Timber Harvest/Buffer Prescriptions
Riverine	Flow through Impounding	Forested Scrub/shrub Emergent Aquatic bed	Any	No harvest will occur in riverine forested wetlands of either HGM sub-class; Buffers on riverine wetlands will be established consistent with management prescriptions for the establishment of RCRs.
Depressional	Outflow Closed	Forested	> 1.0 acre	If associated with a permanent or seasonal hydro-period[8], protection will be provided either by a no-harvest or a 50%-stem removal management prescription. If associated with an occasional or saturated hydro-period, protection will be provided by either a no harvest, 50%-stem removal, or a compensating cut management prescription.
	Outflow Closed	Emergent	> 0.5 acre	Inner 10 m buffer with a no-harvest management prescription and an outer 10-meter buffer with a 50%-stem removal management prescription.
	Outflow Closed	Scrub/shrub	> 0.5 acres	Inner 10 m buffer with a no-harvest management prescription and an outer 10-meter buffer with a 50%-stem removal management prescription.
	Outflow Closed	Aquatic bed[9]	> 0.25 acres	Inner 10 m buffer with a no-harvest management prescription and an outer 30-meter buffer with a 50%-stem removal management prescription.
Slope		Forested	Any	If associated with unstable slopes, no harvest is permitted.
			> 1.0 acre	If associated with stable slopes, area may receive a compensating cut or 50%- stem removal management prescription.
Flats		Forested	> 1.0 acre	Protection will be provided by either a no-harvest, 50%-stem removal, or a compensating cut management prescription.
		All others	> 0.5 acre	Inner 10 m buffer with a no-harvest management prescription and an outer 10-meter buffer with a 50%-stem removal management prescription.

[7] Bogs of any size that occur in any HGM sub-class or vegetation class except "forested" will be protected with the "aquatic bed" standards; forested bogs will not be harvested.

[8] Hydro-period defined:
Permanent hydro-period: Standing water year-round.
Seasonal hydro-period: Standing water at least one continuous month during the growing season.
Occasional hydro-period: Standing water less than one continuous month during the growing season.
Saturated hydro-period: Water table within one foot of the surface at least one continuous month during the growing season.

[9] Must have 0.25 acres of open water with characteristic floating or submerged wetland vegetation of this class.

5.2.4 Road Management Program

Simpson will:

Take those road remediation and maintenance actions described in the following subsections to hydrologically decouple and isolate roads within the Plan Area from the channel network.[10]

5.2.4.1 Road Inventory

Simpson will:

(a) Within 1 year after the issuance of the initial ITP, construct a database within Simpson's GIS for organizing, storing and reporting data developed during the road inventory. The database will be constructed so as to be useful in tracking ongoing road maintenance work, the development of short and long-term plans, the establishment of work priorities and the updating of such plans on an annual basis. (Further details relating to the development of Simpson's road inventory database are set forth in Appendix C.)

(b) Within six months after the issuance of the initial ITP, compile a list of problems known to Simpson personnel that are associated with any active, inactive or orphaned road within the Plan Area (the "Interim Inventory").

(c) Within five years after the issuance of the initial ITP, systematically collect data on standardized forms for each road segment (including legacy roads) and for each defined channel intersection that occurs within that segment for all roads in the entire Plan Area. These data will be compiled into a list of specific projects, which will constitute the "Complete Inventory" when added to the "Interim Inventory".

(d) Conduct a road monitoring project to determine the quantity of fine sediments delivered to the channel network from the road system (in accordance with Section 9).

5.2.4.2 Road Remediation

Simpson will:

(a) Within six months after the issuance of the initial ITP, identify and rank in priority of need for remediation, those road projects which were identified in the Interim Inventory; within five years after the issuance of the initial ITP, Simpson will identify and rank in priority of need for remediation, those road projects which were identified in the Complete Inventory.

    - In establishing priority rankings, road projects with the greatest potential for adverse impacts on covered species and water quality will be selected as highest priority for remediation. Special scrutiny will be given to roads along valley bottoms, roads crossing unstable slopes, roads with high numbers of channel intersections that have either had a history of fill failures or may be susceptible to debris torrents and roads that significantly alter local hillside or channel drainage and flow patterns. The Scientific Advisory Team ("SAT") will be solicited for comments on remediation priorities.

---

[10] Among other results, the expectation of this program is that the LTU/channel class sediment load allocations identified in the TMDL will be achieved. These assumptions will be validated or rejected through the Monitoring Program (Section 9) and management prescriptions of the Road Management Program will be subject to the Adaptive Management process set forth in Section 10.

- Where Simpson chooses to retain road segments that lie tangential to the stream and are within the RCRs designated by Appendix B, Tables 28 and 29, the area covered by the "footprint" of the road and the cleared road right of ways shall be added to the RCR in nearby areas and shall be composed of trees similar in size and species characteristics as those that would normally be found at the site.

(b) Beginning in year one of the Plan remediate roads based on the established priorities and in accordance with the following schedule:

- At Simpson's option, the remediation of roads may involve "decommissioning" or "upgrading" such roads or rendering such roads "dormant".

Simpson will complete 25% of the road inventory projects by the fifth anniversary of the Initiation Date, 75% of the road inventory projects by the tenth anniversary of the Initiation Date, and 100% of the road inventory projects by the fifteenth anniversary of the Initiation Date. "Initiation Date" means, for the initial area within the Tree Farm, the date that the ITP is first issued and, for all Subsequent Units, the date on which such Units are first added to the Tree Farm. (Any lands added to the Tree Farm after the date on which the ITP is first issued, will constitute separate "Subsequent Units.") For the initial area within the Tree Farm, road inventory projects include each road inventory project identified on the Interim and Complete inventory. For each Subsequent Unit, the road inventory projects will include each road inventory project identified on the supplemental inventory list to be prepared pursuant to Sections 5.1 and 5.2.4.1(c) of the HCP (including road inventory projects completed in the Subsequent Unit after the applicable Initiation Date and before the date on which such supplemental road inventory is completed). For roads selected by Simpson for remediation, Simpson will remediate such roads using industry's then-prevailing best management practices.

(c) For roads selected by Simpson for decommissioning, decommission the roads so that the hill slope function will return to a natural state and that natural drainage patterns will be re-established usually by application of the following management prescriptions:

- Fills and drainage structures will be removed.
- Side casts will be pulled back.
- Cut banks will be stabilized.
- The related road prism will be obliterated and revegetated.
- At least 50% of the road surfaces put into a "decommissioned" state (within the road closure areas identified in Section 5.5.5 below) during each calendar year will be seeded with a wildlife forage mix from certified mixes containing no noxious weeds such as tansy ragwort, reed canary grass or Canadian thistle.

(d) For roads selected by Simpson for dormancy (see Glossary), put such roads into a dormant condition by blocking vehicle access to them.

- Dormant roads will be cross ditched to the extent necessary to ensure that drainage functions are maintained.

(e) For roads selected by Simpson for upgrading, upgrade such roads using best management practices and techniques appropriate to the character of the problems being addressed; this work will typically concentrate on the causal agent rather than any specific symptoms of the problem; typical kinds of upgrading work expected to be conducted would include the removal of over-steepened sidecast that has developed tension cracks, adding relief culverts, constructing driveable dips, outsloping or crowning roads, armoring ditch lines, constructing catch basins in ditch lines, and replacing inadequately sized culverts and culverts that restrict the upstream movement of salmonid fishes.

5.2.4.3 Road Maintenance

Simpson will:

(a) Maintain road surfaces on active haul routes in good condition (see 5.2.4.4(a) below);

(b) Conduct patrols of the road system during storms for the purpose of averting culvert blockages and other preventable maintenance problems;

(c) Promptly make all necessary emergency road repairs to active haul routes and conduct an analysis of each road failure to include: 1) a description of the failure, 2) an estimate of the amount of sediment delivered to any channels, 3) a determination of the triggering mechanism, and 4) a description of what measures were implemented in the upgrade to prevent a reoccurrence of the problem;

(d) Make all road repairs consistent with best management practices and the design standards for new road construction;

(e) Where operationally feasible, retain logs removed from culvert entrances and bridge piers in the channel network as close to their point of removal as possible. If it is impossible to retain them in this fashion they shall be stockpiled for later placement in other streams deficient in wood debris.

5.2.4.4 Road Use

Simpson will:

(a) Take appropriate actions to minimize surface erosion from active haul routes. The following are examples of the techniques that will be used but do not represent an exhaustive list (selection of appropriate techniques will be at Simpson's option): temporarily suspend hauling activities; improve competence of road surface; use road drainage features such as driveable dips or out-sloped roads to drain running surfaces; discharge ditch water onto a forest floor capable of filtering sediment prior to delivery to channels; and implement sediment trapping techniques within the ditch system such as catch basins and check dams.

(b) Provided that Simpson is able to enter into an appropriate Memorandum of Understanding with the Department of Fish and Wildlife for the State of Washington pursuant to which the Department would commit to provide gate signs and appropriate law enforcement measures to enforce road closures, keep road closure areas 1, 2, 3, 7, 9, and 12 (as shown in Figure 9 and Table 17) closed year round to all motor vehicle traffic other than motor vehicles used by Simpson personnel, contractors, Simpson authorized permit holders or others directly associated with the management of Simpson's land.

5.2.4.5 New Road Location, Design, and Construction

Simpson will:

(a) To the extent operationally feasible, avoid new road locations on steep slopes (>60%) with potential for delivery to streams, limit roads through riparian areas, minimize the number of channel crossings, and design roads to ensure continuity in subsurface flow pathways.

- Where new or reconstructed roads pass through riparian areas, the area covered by the “footprint” of the road and any cleared road right of way shall be added to the RCR in nearby areas and composed of trees similar in size and species characteristics as those removed for road construction.

(b) Retain a qualified geotechnical expert and road engineer for analysis and design of any new road construction or road reconstruction in high risk areas.

(c) Construct all new roads in accordance with best management practices and the following standards:

- All permanent crossings of fish bearing streams shall have a natural stream bed and be designed for the upstream migration of juvenile salmonids.
- Size stream crossing culverts to the 100-year flow.
- Use driveable dips, crowning, or out-sloping to drain the running surface of new roads.
- Install flumes and/or energy dissipaters to prevent erosion at relief culvert outfalls where needed.
- Install, construct, and manage relief culverts and ditches to prevent the piracy and transfer of water between small catchments; relief culvert discharge will not be directed onto unstable areas but rather designed where possible to distribute water that accumulates on road surfaces and in ditch lines to areas where it may infiltrate stable slopes and reenter subsurface flow pathways rather than route quickly to channels.

5.2.5 Unstable Slopes Management Program

Simpson will:

(a) Use all of the existing information associated with mass wasting reports, causal mechanism reports and prescriptions currently set forth in each of the following formal Washington State Watershed Analyses: Kennedy Creek, February 1995; West Fork Satsop River, November 1995; South Fork Skokomish River, October 1997. All such mass wasting information is hereby incorporated by reference and will be used by Simpson only for the purposes of delineating unstable slopes. Complete copies of these analyses have been made available to the Services by Simpson and are available for public review upon any reasonable request made to the Services.

(b) Use information identified in 5.2.5(a) above for delineating analogous unstable slopes in the unanalyzed portions of the Plan Area until the analysis identified in 5.2.5(c) has been completed.

(c) Within five years after the issuance of the initial ITP, complete an analysis of slope stability that delineates unstable slopes at a coarse scale and provides specific guidance for delineating unstable slopes at the timber harvest unit layout scale in the Plan Area where formal Watershed Analysis has not been conducted:

- The methods used for these analyses will be at least as rigorous and detailed as those required for a Level II Watershed Analysis under the Washington State methodology.
- The personnel performing these analyses will have qualifications that exceed those required for certification to perform Level II Watershed Analysis under the Washington State methodology.

(d) Not harvest timber on slopes designated as unstable.

(e) Review with the Services and necessary slope stability experts the efficacy of all mass wasting related management guidelines and activities on a periodic five year basis. Any changes resulting from such reviews are subject to specific guidance in Section 10 of this HCP.

5.2.6 Hydrologic Maturity

Simpson will:

Manage forest cover in the sub-basins in Table 6 (shown in Figure 7) such that hydrologically mature forests cover at least 50% of the area in each sub-basin and no more than 25% of the area in each sub-basin is covered by hydrologically immature forests.

Table 6. Basins of the CUP where harvest will be timed to prevent extensive coverage of immature forest canopy.[11]

Basin	Simpson Acres
830 Creek	1,084
Aristine Creek	1899
Devils Club Creek	811
Dry Bed Creek	1,543
North Mt. Creek	952
Save Creek	787
South Mt. Creek	860
Total	**7,936**

[11] Hydrologically mature forest cover refers to stands with greater than 70% total crown closure that are less than 75% deciduous. Hydrologically immature refers to stands with less than 10% crown closure and/or are greater than 75% deciduous cover. These definitions are taken directly from the methods used in the assessment of hydrologic maturity for watershed analysis in the State of Washington (Board Manual: Standard Methodology for Conducting Watershed Analysis, Version 3.0, November 1995).

5.2.7 Experimental Management

Simpson will:

(a) In the first 10 years of the Plan, experimentally manage up to 1,000 acres of RCR for purposes of accelerating the development of late seral forest characteristics and developing a range of options for adaptive management discussions at year 10. Such acres that are available for this experimental management treatment are identified by guideline 2 or 3 in Table 26 of Appendix B.

- For purposes of this prescription "late seral forest characteristics" shall mean those characteristics of forests greater than 120 years of age that could be expected to exist for specific riparian plant associations of the Plan Area.
- Acres subject to this experimental management shall be allocated based on a weighted distribution by the number of miles of each channel class designated for riparian management guidelines 2 or 3 in Table 26 of Appendix B.
- Management treatments may vary but will be guided by general objectives above, however, treatments shall be generalizable to specific channel classes or plant associations. Multiple treatments will be evaluated so that a range of options can be developed for adaptive management discussions.
- The remaining acreage identified for management by guidelines 2 or 3 in Table 26 of Appendix B shall be held in reserve and not harvested pending the outcome of monitoring results and adaptive management discussions.
- Monitoring work to evaluate the results of the management treatments will be part of the resource monitoring program and prioritized in accordance with overall monitoring and research commitments and costs.

(b) Within 5 years of Plan signing and subject to any contrary state law, establish an experimental pilot project to investigate operationally practical ways to add wood to streams for the purpose of increasing the complexity of fish habitat. Such work will be part of the habitat monitoring program and will be prioritized in accordance with overall monitoring and research commitments and costs.

5.2.8 Supplemental Prescriptions for Changed Circumstances

Simpson will:

Implement supplemental prescriptions in certain changed circumstances. Such circumstances and applicable supplemental prescriptions are described in total in Appendix F.

Figure 7. Hydrologic maturity sub-basins

Note: this figure is available for viewing as a separate file.

5.3 PRESCRIPTIONS THAT ADDRESS SPECIFIC WILDLIFE SPECIES

So long as any of the following wildlife species are "covered species" under the IA, Simpson will implement the following management prescriptions.

5.3.1 Marbled Murrelet

Simpson will:

(a) Establish and implement the RCR program.

(b) Prohibit harvest in all occupied murrelet habitat currently existing or hereafter developing within the RCRs.

(c) Prohibit harvest in all occupied murrelet habitat outside the RCRs. For the purposes of this paragraph, and paragraphs (d) through (h) below, occupied murrelet habitat shall mean those areas of murrelet habitat identified by the 1995 Simpson habitat assessment that is determined to be occupied using the latest survey protocols approved by both the USFWS and the WDFW. The most recently approved protocol is defined in the Pacific Seabird Group ("PSG") document: *Methods for surveying marbled murrelets in forests* (Ralph et al. 1994), and as amended by the March 8, 1995 information letter (Ralph et al. 1995). Simpson will implement these survey protocols with ten surveys per year for two consecutive years during 1998 and 1999. Any murrelet habitat that is not found to be occupied based on the 1998 and 1999 surveys will be deemed to be unoccupied and no further surveys of these habitats will be required for the remaining term of the Plan. However, if at a later time, nesting is detected in previously surveyed habitats, the stands will be considered occupied.

(d) Limit timber harvest within 300 feet of any occupied murrelet habitat located outside of the RCR so that such harvest will not reduce the residual stand stem density within such 300 foot buffer to less than 75 trees per acre with 12 inches DBH or greater, including 5 trees greater than 20 inches in DBH, where they exist.[12]

(e) Refrain from timber harvest and road construction within 300 feet of occupied murrelet habitat where such habitat is within an RCR and where such buffer is located within in the RCR.

(f) Limit timber harvest or road construction within 300 feet of occupied murrelet habitat where such habitat is within an RCR and where such buffer is located outside of the RCR so that such harvest will not reduce the residual stand stem density within such 300 foot buffer to less than 75 trees per acre with 12 inches DBH or greater, including 5 trees greater than 20 inches in DBH, where they exist. Provided, however, that Simpson need not protect more than 150 acres of such buffers which are located outside of an RCR over the Plan Area.

(g) Refrain from road construction, felling, bucking, cable yarding, helicopter yarding, tractor and wheeled skidding and slash disposal/prescribed burning within 0.25 mile of an occupied

[12] The width of the buffer zone may be reduced in some areas to a minimum of 200 feet and extend to a maximum of 400 feet as long as an average of 300 feet is maintained.

marbled murrelet site during the two hours after sunrise and the two hours before sunset from April 1 to August 31.

(h) Refrain from blasting at any time from April 1 to August 31 within 1.0 mile of an occupied murrelet site.

5.3.2 Bald Eagle

Simpson will:

(a) Establish and implement the RCR program (Section 5.2.1) and the Wetlands Conservation Program (Section 5.2.3)

(b) Comply with all Washington state rules (as such rules currently exist) regarding the conservation of eagle roost and nest sites (RCW 77-12-655; WAC 232-12-292).

5.3.3 Band-tailed Pigeon

Simpson will:

(a) Conserve all mineral springs found in the Plan Area with a minimum two acre no harvest conservation buffer.

(b) Refrain from aerial spraying of pesticides within 50 feet of surface water, including forested and all other wetlands greater than 0.25 acres in size provided that application of pesticides that target non-forage species and that have a minimal impact on primary forage species will be allowed.

(c) Refrain from targeting primary band-tailed pigeon forage plants (cascara, elderberry, wild cherry, Indian plum, huckleberry and madrone) with herbicide spray on or over any 5 acre area that has a high percentage cover of these species, provided that application of pesticides that target non-forage species and that have a minimal impact on primary forage species will be allowed. A high percentage cover for this prescription is defined as any 5 acre area that has more than 50% cover by these forage species when they are in full leaf.

(d) Refrain from issuing special forest products harvesting permits for the harvest of cascara bark, branches or fruit during the Plan period.

5.3.4 Harlequin Duck

Simpson will:

(a) Establish and implement the RCR Program (Section 5.2.1) and the Wetlands Conservation Program (Section 5.2.3)

(b) Refrain from timber harvesting, road construction and blasting within 0.25 miles of known nesting harlequin ducks, unless an acceptable alternate distance and operation plan is agreed to by the Services and Simpson.

5.3.5 Roosevelt Elk

Simpson will:

(a) Establish and implement the RCR Program (Section 5.2.1).

(b) Keep road closure areas 1, 2, 3, 7, 9, and 12 (as shown in Figure 9 and Table 17), closed year round to all motor vehicle traffic other than motor vehicles used by Simpson personnel, contractors, Simpson authorized permit holders or others associated with Simpson land management, provided that Simpson is able to enter into an appropriate Memorandum of Understanding with the Department of Fish and Wildlife for the State of Washington pursuant to which the Department would commit to provide gate signs and appropriate law enforcement measures to enforce road closures.

(c) Seed at least 50% of the road surfaces put into a "decommissioned" state (within the road closure areas identified in Section 5.5.5 below) during each calendar year with a wildlife forage mix from certified mixes containing no noxious weeds such as tansy ragwort, reed canary grass or Canadian thistle.

(d) Limit logging truck traffic on the road adjacent to the Wynoochee elk pastures to June 1-October 31, with the condition that Simpson would be able to use the road for logging trucks during the month of November if unusual weather conditions prevent the completion of hauling before then. If November hauling is necessary, Simpson agrees to open and close gates, or otherwise staff the gates, so that they are closed except to allow log trucks through. This restriction does not apply to other motor vehicles used by Simpson personnel, contractors, Simpson authorized permit holders, and others associated with Simpson land management.

5.3.6 Purple Martin

Simpson will:

(a) Construct and install at least 4 multi-unit artificial nest boxes on that part of Lake Nahwatzel adjacent to Simpson owned lands, within 10 feet of the water.

(b) Annually record the number of pairs using the boxes and maintain the nest boxes.

5.3.7 Snag Dependent Species

Simpson will:

Establish and implement (a) the RCR Program (Section 5.2.1); (b) the Wildlife Tree Conservation Program (Section 5.2.2); and (c) the Wetlands Program (Section 5.2.3).

Figure 8. Late-seral forest reserves and potential marbled murrelet habitat

Note: this figure is available for viewing as a separate file.

Figure 9. Road closure areas

Note: this figure is available for viewing as a separate file.

6 CONSERVATION PROGRAM EXPLAINED

6.1 GENERAL

Simpson's conservation program emphasizes the protection and development of riparian forests as the primary strategy for satisfying requirements of Section 10 of the ESA. Complementing the functional approach to riparian forest and stream habitat conservation are measures that address specific wildlife species. The management prescriptions in this HCP are expected to conserve riparian forests, improve water quality, prevent management related hillslope instability, address hydrologic maturity of small sub-basins, maintain and generate late-seral riparian forests and snags, and control human disturbance to wildlife species. The suite of management prescriptions described in Section 5 is expected to benefit a wide range of species that inhabit the Plan Area including others not listed in Table 1 or Table 2 and for which no ESA coverage is sought.

What follows is a brief explanation of how the management prescriptions are expected to provide these benefits. For ease of reference, the subsections of this Section 6 are organized to correspond directly to their counterparts in Section 5. For example, wetlands prescriptions which are set forth in Section 5.2.3 are expected to produce certain benefits, which are explained in Section 6.2.3. Table 13 provides a summary of the linkages between the aquatic species, the resource goals and objectives, management prescriptions, and the expected benefits from the conservation measures while Table 16 provides correlative information for wildlife species listed in Table 2.

6.2 EXPLANATION OF PRESCRIPTIONS THAT ADDRESS MULTIPLE SPECIES

6.2.1 Riparian Conservation Reserve

Riparian forests are some of the most diverse ecosystems in the forested landscape, providing habitat for many wildlife species in western Washington. The use of riparian areas by wildlife species is disproportionate to their overall occurrence in the landscape, making them especially critical areas to protect and increasing the conservation benefits for investments made there. These same riparian forests are critically important in providing the ecological components of healthy streams.

Aquatic ecosystems are strongly connected to the terrestrial landscape through which they flow. The streamside or riparian forest is the direct linkage between these two systems and the condition of the riparian forest along with the geomorphic setting, determines the character and quality of the aquatic habitat. Inputs from the riparian forest moderate, buffer, or control the physical, chemical, and biological processes within the channel network at several temporal and spatial scales. Mediation or maintenance of these physical processes and ecological functions is important for the survival of particular species and entire aquatic species associations.

The following functions of riparian forests are the focus of the Plan's management prescriptions: (1) wildlife habitat, (2) recruitment of woody debris to streams and forest floor, (3) shade and control of streamside air temperature, (4) stream bank stability, (5) detrital inputs, (6) capture and storage of sediment and organic matter on the floodplain, (7) maintenance and augmentation of nutrient dynamics and processing, and (8) provision of nurse logs. The importance of any one of these functions at any given site will depend on its location in the landscape and in the channel network and/or the specific geomorphic context of the setting. The maintenance and development of these functional interactions of riparian forests with the stream environment is the focus of the HCP riparian management.

A majority of the wildlife habitat conservation prescriptions proposed in this plan are concentrated in and adjacent to stream and wetland riparian ecosystems. These systems provide a network that extends throughout the planning area, and thus distributes these conservation benefits throughout the HCP landscape.

6.2.1.1 Scope and character of the RCR

Simpson estimates that a total of 30,219 acres or 11.6 percent of the Plan Area, will be included in the RCR (Table 7). The RCRs will be distributed throughout the Plan Area along all stream classes and will encompass riparian areas, wetlands, and some contiguous unstable upland areas. Figure 5 is a representation of Simpson's best estimate of the distribution and extent of the RCRs. The total acreage estimate for the RCR was derived from several planning processes that Simpson has conducted including internal basin planning, planning associated with the Washington State Shorelines of Statewide Significance, Watershed Analysis, and resource planning associated with this HCP. These planning efforts required aerial photo interpretation, zone width application through Simpson's GIS, and field verification of select areas. Simpson will track the actual "as cut" RCR acreage and will report those figures by timber harvest unit and LTU in annual Implementation Monitoring reports (see Section 8). Manipulation of stands (thinning) will not occur in the RCR except as provided for on any experimental basis (See Section 5.2.7). This experimental management will not occur on more than 1,000 acres of the RCR prior to evaluation of associated monitoring results and adaptive management discussions pursuant to Section 10. The objective of any management in the RCR will be to accelerate the development of late seral forest characteristics.

Table 7. Estimates of different types of conservation lands within the Plan Area.

Conservation Area Category	Acres	Percent of Plan Area
RCRs		
Riverine RCRs (includes unstable slopes within the functional riparian boundaries)		
Continuous no harvest riverine RCR	12,042	4.6
Continuous thinned riverine RCR	6,160[13]	2.4
Discontinuous riverine RCR	1,417	0.5
Other		
Delivering unstable slopes, outside but contiguous with, functional riparian boundaries	6,019	2.3
Wetland RCRs		
No harvest wetland RCR	1,946	0.7
Thinned wetland RCR	2,635	1.0
RCR Sub-total	***30,219***	***11.6***
WETLANDS		
Non-forested wetlands	6,059	2.3
Forested wetlands (one half of these acres will be conserved)	3,724	1.4
Riverine channel bed	2,572	1.0
Wetland Sub-total	***12,355***	***4.7***
Total Conservation Area Acres	***42,574***	***16.3***

[13] The actual amount of managed RCR is controlled by prescriptions in Section 5.2.7 and will not exceed 1,000 acres in the first 10 years of Plan implementation. The remainder of RCR acreage identified for management is held in reserve pending the outcome of monitoring results and adaptive management discussions.

One of the primary wildlife habitat management goals of this HCP is to conserve and develop mature and late-seral forests, which can be used as core areas for various wildlife species. This goal will be achieved by implementing the riparian conservation reserve strategy, including areas identified as Late-seral Forest Reserves (LFR). These conservation actions will maintain existing forests greater than 50 years old (60% of RCR) in these areas, and enhance the availability of old-age forest habitat by allowing these forests to grow to old-age. The LFRs will be connected to adjoining forests conserved in the RCR network, and younger forests (30-50 years old) also will be dispersed in surrounding timber management areas.

Nine LFRs have been identified due to their relatively large contiguous size and relatively old forest conditions. These LFRs range in size from 263 acres to 1,234 acres, with an average of 713 acres. These areas are named according to their respective river drainages, as listed in (Table 8) and shown in (Figure 8). The vegetation composition in these areas was determined from aerial photos; forest ages were estimated from timber inventory data and site assessments (Table 8).

Overall, a majority of these LFRs currently have mature (50+ years old) hardwood forest, with a lower percentage of coniferous forest. However, the largest LFR (1,234 acres) consists of 51 percent coniferous forest, of which 69 percent is at least 50 years old. Additionally, six of the nine LFRs have at least 30 percent coniferous forest 30-50 years old (Table 8). Small (2 to 60 acre) patches of old-age (more than 100 years-old) and old-growth (120+ years- old) coniferous forest also exist in some of these areas. Many of those old-growth stands have been identified as marbled murrelet habitat, as shown in Figure 8.

Table 8. Late-seral Forest Reserves (LFR) proposed for the Plan Area.

Late-seral Forest (LFR) Area	Acres	Non-For.	Con. For.	Portion of coniferous forest		Dec. For.	Portion of deciduous forest	
				Over 50 yrs old	Over 70 yrs old		Over 50 yrs old	Over 70 yrs old
Wynoochee 1	346	14%	43%	38%	17%	43%	21%	17%
Wynoochee 2	747	25%	22%	6%	0%	53%	34%	16%
WF Satsop 1	406	11%	17%	3%	2%	72%	59%	41%
WF Satsop 2	805	1%	25%	15%	3%	74%	74%	52%
Canyon River	1216	0%	30%	15%	9%	70%	61%	49%
MF Satsop	1003	1%	30%	12%	8%	69%	69%	67%
Vance Creek	263	16%	49%	22%	0%	35%	27%	0%
SF Skokomish	395	29%	32%	25%	13%	39%	37%	17%
NF Skokomish	1,234	1%	51%	69%	6%	48%	96%	20%
Overall	**6,415**							

Non-commercial forest includes: brush, barren, wetlands, and open water.
Coniferous forests are those forests with more than 50% coniferous trees in the overstory.
Deciduous forests are those forests with more than 50% deciduous trees in the overstory.

6.2.1.2 RCR Boundaries

Outer boundaries of the RCR are determined in two ways; by *functional* widths as designated in Table 26 of Appendix B or by the extent of adjacent *unstable* slopes as determined through provisions in Section 5.2.5, whichever is greater. The establishment of this kind of integrated riparian reserve is expected to maintain recruitment of logs to the channel network at virtually full landscape potential.

6.2.1.2.1 Riparian functional boundaries

Simpson's riparian conservation prescriptions differ from other traditional approaches that use the ordinary high water mark ("OHW") as the benchmark for measurement of riparian buffer width. HCP riparian reserve widths have been designated by channel class (Table 25, Appendix B). These widths were determined by identifying the primary zones adjacent to each channel class where the functional interactions with the riparian forest are most pronounced. These primary interaction zones are given full no-harvest protection. For example, the highly to moderately confined channels of the AGL tend to recruit the greatest proportion of their "on site" woody debris and derive their shade from trees and underbrush growing on discontinuous terrace surfaces and the adjacent incised side slopes comprising the valley walls. Consequently both the channel migration zone and side slope surfaces are accorded full no-harvest protection by the "Break in Slope" riparian strategy (see Appendix B, channel classes AGL-Qo3, 5, 6, and 7). The widths of these zones are actually measured from the break in slope.

This method of measurement incorporates substantial area (including the most critical functional zones) as riparian reserves that are transparent in the designated widths in Table 26, Appendix B (i.e. the horizontal width of the valley floor and the side slopes does not show up in the width of the riparian area when it is measured from the "break in slope"). Figure 10 depicts a hypothetical valley cross section illustrating the three topographic breaks that are utilized in Simpson's system. In only a single case of the 49 channel classes, distributary segments of alluvial fans (ROP-C7), is the OHW used. In this case the edge of the OHW of the outermost segments on each side of the fan are used.

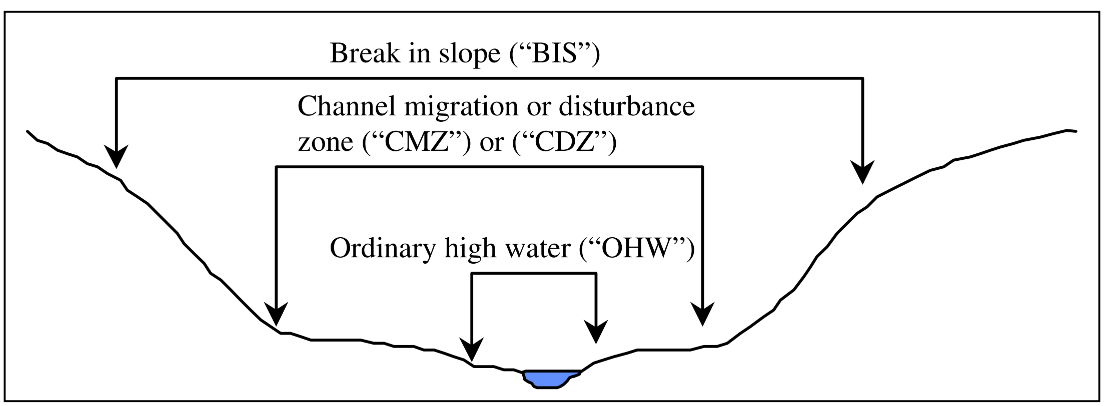

Figure 10. Hypothetical valley cross section showing the various topographic breaks and surfaces that serve as measurement benchmarks in Simpson's riparian approach.

6.2.1.2.2 Unstable slope boundaries

The RCRs are defined not only by the functional boundaries for each channel class but also by the extent of unstable, delivering side slopes. In many cases the delineation of unstable slopes describes a more extensive riparian leave area than would be derived by simply implementing the prescriptions contained in Appendix B. The recognition of the role unstable slopes play in delivering woody debris and coarse sediment to many channel classes in the Plan Area is considered pivotal in the riparian strategies. The several large irregular leave areas adjacent to the main north-south trending river valleys are good examples of how unstable slopes affect the delineation of the RCR (Figure 5). To a lesser degree throughout the Plan Area, delineated unstable slopes adjacent to many different channel classes add substantial edge irregularity and increase the number of leave trees in the RCR.

6.2.1.2.3 Recruitment of logs and woody debris

In considering how to maintain adequate wood loading in the channel network, Simpson has carefully evaluated how log recruitment processes vary in each LTU and what the dominant recruitment mechanism is for each channel class. This was a critical step in the development of the RCR boundaries, both the functional boundaries (Table 26 and Table 27,) and the unstable slope boundaries (Section 5.2.5) as well as for the narrative descriptions for each riparian strategy in Appendix B. In general, the principal recruitment processes for logs are: mass wasting, bank erosion, (including channel avulsions on large meandering systems) and windthrow. To a much lesser degree, suppression and natural death of trees through vegetative succession is an additional process, but the recruitment of those trees is normally triggered by wind (although they sometimes may fall due to lack of structural support entirely unaided by the wind). Considered together, this last process is the least important of the four in supplying wood to channels of the Plan Area.

Simpson's strategy of riparian and stream management focuses on setting the landscape up for productive habitat development when natural disturbances occur. It is just these disturbances in fact that Simpson's riparian strategies anticipate. For example, it is expected that 100% of all the possible logs that might recruit to the channel network owing to floods and erosion of lands within the channel migration zone will occur under HCP management because all those lands are given 100% protection. The same holds true for recruitment from mass wasting. Since all of the delivering unstable slopes are protected from harvest, the full potential for supplying logs will be preserved. In the case of windthrow, Simpson has modeled its riparian prescriptions after the conclusions reached from analyses graphically represented in Figure 17, Appendix E. It is expected that approximately 75% of the wood loading (based on a conservative definition) due to windthrow will be realized. In actuality this figure will be much higher because it will include a higher per piece wood volume from trees close to the stream. The further away trees are from the stream, the lower per piece volume they contribute owing to taper in the bole of the tree.

These different recruitment processes do not affect all channel classes equally. However, in the development of its riparian strategies, Simpson has endeavored to capture the most important or dominant process for each channel class. Therefore it is expected that somewhere between 75 and 100% of the potential log recruitment will be preserved by HCP management for all channel classes. Due to the highly variable nature of wood loading in streams, even under unmanaged conditions, for all channel classes, this level of wood loading will be virtually non-detectable from 100% of the landscape and channel segment potential. This is not to say however, that all riparian lands of the Plan Area today are immediately capable of supplying the number and character of logs that represent the landscape and channel segment potential, as many of these trees were removed during previous harvest. The landscape is now in various stages of forest succession and stand age and HCP management will preserve these stands promoting their development for present and future functional contributions to riparian and stream ecosystems.

6.2.1.3 Forest Stand Types

Vegetation cover types and age classes within the RCR were determined by delineating the proposed RCR boundaries (as defined in previous sections and shown in Figure 5) on aerial photos and then determining vegetation types in those areas. Current vegetation conditions could not be determined in the case of those segments receiving discontinuous buffers because those segments will not be identified for certain until timber harvest unit layout. However, Simpson does know that a vast majority of those forests, in the smaller headwater streams, where the discontinuous buffers apply, are coniferous. Additionally, these areas make up about 5 percent of the total RCR, therefore, the percentage of cover types determined for known RCR areas were used to approximate the entire RCR network. The results of this assessment (Table 9) show that approximately 79 percent of the Plan Area conservation lands are forest, and 21 percent is non-forest. "Non-forest" includes shrublands, non-forested floodplains, open water and non-forested wetlands. Of the conservation lands approximately 49 percent and 31 percent are coniferous and hardwood forest, respectively.

Table 9. RCR forest cover type by LTU.

LTU	Acres	Percent Total	Percent Coniferous	Percent Deciduous	Percent Non-forest
AGL	4,526	10.6	29	51	20
CIS	2,314	5.4	35	53	12
CUP	5,322	12.5	86	11	3
ROP	13,471	31.7	43	15	42
SIG	16,941	39.8	51	39	10
Total	***42,574***	***100.0***	***49***	***31***	***20***

Figure 11 shows the percent of forest cover types in the RCR, by age, as anticipated for each cover type in plan years 1, 25 and 50. Current conditions of forests and species dominance were compared with expected natural successional trends to derive estimates of expected forest plant community in the RCR. Based on these initial general estimates, at least 20 percent of the stands currently dominated by hardwoods are expected to convert to mixed conifer and hardwood stands or stands dominated by conifers by year 25 and a total of 35 percent of the original hardwood stands will likely convert to stands dominated by coniferous trees by year 50. The natural succession and conversion of hardwood stands to conifer dominated stands is considered important to the long term recruitment of woody debris and natural functioning of Plan Area streams and will be a subject of the Monitoring Program (Section 9) and Experimental Management (Section 5.2.7). Figure 11 does not represent these anticipated successional changes since the character and composition of those stands is difficult to predict.

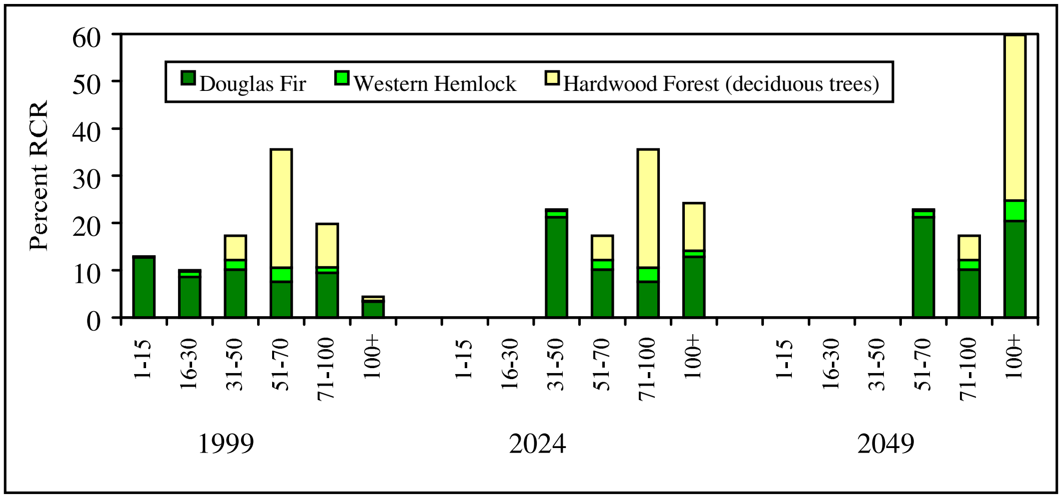

Figure 11. Percent of forest cover types in RCR by age, for beginning, middle and end points of the plan period.

Some stands of the younger age classes (absent from Years 2024 and 2049 in Figure 11) most likely will be present in the RCR during the plan period as a result of natural regeneration after natural disturbances. It is difficult to predict the acreage of those stands with the data and growth models used for this analysis, but it is expected that this acreage will be less than 5 percent of the total RCR. Hardwood cover types indicated as being >71 years are senescent and are assumed to be following several potential successional pathways which will be one of the subjects of the resource monitoring program.

6.2.1.4 Overall Number and Size of Leave Trees

Currently 22,397 acres of the RCR have stands of timber greater than 30 years old with an average diameter breast height (“DBH”) of greater than 8 inches. These stands average 175 trees per acre. Therefore, Simpson estimates that currently there are more than 3.9 million trees in the 30+ year age class in the RCR. On a Plan Area-wide basis, this number of trees is equivalent to an average of 15 trees per acre across the Plan Area. Although these leave trees are not evenly distributed across the landscape, the RCR does provide a wide network of leave trees and conservation zones throughout most of the Plan Area (Figure 5). This distribution is considered to be favorable for many wildlife species due to the high density and wide distribution of these trees across the HCP landscape.

Of the remaining portion of the RCR, 2,875 acres currently consist of stands of less than 30 years in age, but which are expected to be greater than 30 years old by year 25 of the plan (e.g. 2024). This additional acreage of forest will provide at least 500,000 additional conservation trees in the RCR greater than 30 years old at least by Year 25. The remaining 3,720 acres in the RCR most likely will not support stands with timber older than 30 years at mid-plan period due to particularly young age at the date of plan initiation. Many of these remaining acres are currently dominated by shrubs.

Some trees currently in the RCR will be lost through future natural disturbances, such as wind storms and floods, however other trees will establish and grow to maturity. Given these assumptions, and barring a major as yet unprecedented catastrophic event, and taking into account the limited harvest permitted in the RCR under this plan, the average number of leave trees is expected to remain relatively stable throughout the life of the plan subject only to natural successional changes.

Table 10 shows the average DBH of trees in the six age classes defined for the Plan Area. The table also shows the average DBH of the 40 largest trees (dominant and co-dominant canopy layers) within each stand, which are typical of the dominant and co-dominant canopy layers for each age class. Given these size class estimates in Table 10 and also the age class distributions shown in Figure 11, one can conservatively conclude that a majority of 3.9 million trees in the RCR at Year 1 will be at least 30-50 years old, with an average DBH of at least 13-16 inches (Table 10). During years 25 through 50 of the plan a majority of the trees in the RCR will be at least 50 years of age with average DBH between 15 to 20 inches (Table 10).

Table 10. Approximate average tree diameter at breast height for six age classes in the Plan Area.

Forest Age Class	Data Source	Average DBH of All Trees > 4 inches DBH		Est. Average DBH of Dominant/Co-dominant (40 largest trees/acre)	
		Coniferous	**Deciduous**	**Coniferous**	**Deciduous**
1-15	Survival Surveys	3.0	1.5	4.0	3.0
16-30	Survival Surveys	6.0	5.0	8.0	7.0
31-50	Forest Inventories	13.0	14.0	16.0	14.0
51-70	Forest Inventories	15.5	14.4	20.0	14.4+
71-100	Forest Inventories	14.7	14.0+	28.0	14.0+
100+	Forest Inventories	15.4	14.0+	32.0	14.0+

Coniferous tree DBH data is limited to Douglas fir species.
Deciduous trees greater than 70 years old are predominantly big leaf maple and cottonwood.

Corroborative evidence for the size of Douglas fir in the RCR (Douglas fir constitute 23% of all trees in the RCR) comes from riparian monitoring done by Simpson (Appendix E). The average size Douglas fir is currently 42 cm (17 inches) with good representation of larger individuals that are now even capable of playing key member roles in streams as they are recruited.

6.2.1.5 Stand Characteristics by Channel Class

Simpson's riparian strategy is difficult to compare to more traditional approaches that define riparian areas based on measurement of a regular distance from the OHW mark. Since Simpson's measurement point is either the CMZ, CDZ or the BIS, many acres of riparian and valley wall land are transparent in the width measurements in Table 26, Appendix B. Consequently it is difficult to evaluate strategies in the more traditional ways (i.e. leave trees per unit length of stream) and to assist reviewers in this regard tree density and basal area for the stands retained by the prescriptions are presented in Table 11. Information from 30 riparian monitoring sites and upslope forest inventory from the Plan Area were used in this analysis. Since detailed cover typing by channel class is incomplete at this time it was necessary to establish typical densities that are referred to as wet or dry sites and apply them appropriately to each channel class. The principal difference between wet and dry sites is that wet sites have a greater proportion of hardwoods growing on the CMZ/CDZ and slope surfaces than dry sites. Densities and basal area for hardwood and conifer were developed for the 3 surfaces, terrace or CMZ/CDZ, slope and upslope and then applied to the leave acreage on one side per 1,000 feet of channel. The density and basal area was appropriately reduced for channel classes that have some portion of their leave areas managed (even though this prescription may not be applied).

It is important to note however, that any conclusions reached from these kinds of data must be viewed in an operational context. Clearly there is a continuum of riparian conditions today (for any particular channel class), that is the result of logging operations and silvicultural practices over the last century, which in the last two decades have featured increasing levels of riparian protection and stand management. Without this recognition any description of riparian conditions may be misleading. Current riparian conditions are the product of natural site potential and stand history, including harvest and silvicultural practices. In general, riparian stand history may be described by three harvest and silvicultural histories: 1) naturally regenerated second growth stands of harvestable age today that grew back following harvest of old growth in the early part of this century, 2) plantation forests that were planted after complete harvest of the old growth, 3) combined plantation forests and relatively narrow bands of naturally regenerated second growth next to the stream (increasingly wider zones with more trees since 1986).

Table 11 presents the conditions generally found today adjacent to channel segments that are bordered by harvestable age naturally regenerated second growth stands (Riparian History 1 above). These data represent typical riparian conditions that will be retained during harvest of timber in the first half of the plan period. Segments of channels running through stands that were harvested previous to 1986 are best represented by inventory data from young growth stands and for which no data is presented. In many cases these segments were harvested at a time when no riparian buffers or only minimal non-merchantable buffers were retained, resulting in a riparian potential quite different from stand history 1 described in the previous paragraph. In these cases the majority of trees that will be retained during harvest, which will occur in the last half of the plan period, will be trees that were planted as part of plantation reforestation. In most cases these stands are typified by relatively high density, thrifty Douglas fir stands with lesser components of naturally regenerated hemlock, western redcedar, and alder with occasional residual older trees from the previous stand. Prior to controls on the use of herbicides around water, hardwoods were suppressed chemically in many riparian areas resulting in fast growing conifer stands that will have some of the highest basal area values of riparian reserves in the future.

Simpson is currently supporting studies to describe the natural plant potential of riparian settings in each lithotopo unit by channel class (Peter and Henderson 1999). This information will be useful to refine expectations regarding potential wood loading of channels and help in evaluating riparian and in-channel monitoring data. It may also be invaluable in guiding decisions about future adjustments to riparian management prescriptions pursuant to Sections 5.2.7 and 10.

6.2.2 Explanation of the Supplemental Wildlife Tree Conservation Program

Simpson will conserve a minimum average of 8 trees per acre, at least 10 inches DBH, for each section in the Plan Area. Figure 6 shows the average leave tree density by 10 acre grids and those sections of land where the 8 trees per acre threshold is not met (total 46,612 acres). In these areas special tree conservation management that will ensure the criteria will be met. In many of those cases the criteria will be met by conserving forested wetlands, pursuant to Section 5.2.3.

In addition to the above criteria, Simpson also will voluntarily leave some individual trees or small clumps of trees outside the RCR during harvesting operations. These trees will supplement those that would be present during the course of day-to-day management of 50-year old stand rotations. Conservation of these trees is voluntary because they can not be quantified until after timber harvest is conducted within each timber harvest unit. At this time there are no provisions to include these voluntary trees as mitigation credit, because they can not be quantified. However, this practice currently occurs and will continue to occur and Simpson may at some future date wish to quantify these conservation actions for possible mitigation credit.

Table 11. Estimate of conifer and hardwood trees and basal area per 1,000 feet of channel (one-sided) that will be retained by riparian prescriptions.
Data apply to fish-bearing segments for each channel class and have a conservative bias due to additional leave area required by unstable slopes and other sensitive site requirements that are unaccounted in this "uniform" zone analysis.

LTU	CLASS	TPMft. Conifer	TPMft. Hardwood	TPMft. Total	BAPMft. Conifer	BAPMft. Hardwood	BAPMft. Total
AGL	QA6	328	456	784	487	374	861
	QO1	175	111	286	253	91	344
	QO2	180	137	317	261	112	373
	QO3	202	84	286	298	68	366
	QO4	200	178	379	290	146	436
	QO5	212	154	366	307	126	433
	QO6	234	98	332	348	79	427
	QO7	259	120	379	382	97	479
	QO8	357	208	565	521	169	691
CIS	C1	166	106	272	225	97	322
	C5	272	176	448	371	163	535
	QC1	167	114	282	228	103	331
	QC2	172	138	311	236	123	359
	QC3	215	172	388	296	154	450
CUP	C1	214	65	279	309	59	367
	C2	266	85	351	385	76	461
	C3	266	85	351	385	76	461
	C4	266	85	351	385	76	461
	C5	202	111	312	294	96	390
	C6	320	98	418	461	87	548
	C8	458	120	578	658	108	766
ROP	C7	411	113	525	505	105	610
	QA7	577	403	980	720	391	1112
	QC1	229	71	300	293	61	355
	QC2[14]	82	34	116	110	32	142
	QC3	282	109	392	369	94	463
	QC4	239	59	298	289	55	344
	QC5	390	105	495	484	97	581
	QC6	407	149	556	478	124	602
	QC7	559	313	872	721	264	984
	QC8	567	241	808	699	203	902
SIG	L1	141	115	256	234	97	330
	L2	204	289	493	338	240	578
	L3	156	123	279	271	104	375
	L4	655	746	1401	1036	621	1657
	M1	141	115	256	234	97	330
	M2	152	171	322	252	142	394
	M3	203	171	374	353	144	497
	M4	304	261	564	524	220	744
	M5	637	714	1351	984	594	1578
	M6	299	462	761	489	383	872
	QA6	309	513	822	506	425	930
	QC1	142	123	265	236	103	339
	QC2	144	131	275	239	110	349
	QC3	138	165	303	224	137	362
	QO1	142	123	265	236	103	339
	QO2	149	155	303	247	129	376
	QO3	150	105	256	272	90	362
	QO4	238	180	418	425	153	577

[14] Numbers for this channel class are conservative because they represent the smallest members of this channel class (typically found in the southern portions of the ROP – see Appendix D)

The advantage to leaving some wildlife trees scattered across the landscape is that it will: 1) retain some larger tree habitat on the landscape (outside the RCR) when stands are harvested and the regenerating stands are young (e.g. less than 35 years old); 2) these trees provide habitat for a variety of passerine species (e.g. western bluebird) that perch and nest in trees with low stem densities; and 3) these trees provide habitats for other wildlife species across the landscape. These voluntary conservation trees typically will be retained within or adjacent to timber harvest units and consist of trees that: 1) have little merchantable value; 2) do not present a safety liability; and 3) can be left without significantly restricting harvesting or yarding operations. The number of wildlife trees left standing and their location on the landscape will be determined on a case-by-case basis for each particular timber harvest unit.

6.2.3 Explanation of the Wetlands Conservation Program

Wetlands provide many important functions including: fish and wildlife habitat, groundwater discharge, base flow support in streams, flood control, and water quality improvement. The Plan Area has a variety of wetland types ranging from sag ponds on ancient deep seated landslides in the SIG, sphagnum bogs in the ROP, to riverine off-channel systems on the Wynoochee River floodplain in the AGL.

The National Wetlands Inventory ("NWI") and Simpson's own basin planning efforts document a total of 6,059 acres of non-forested wetlands and an additional 3,724 acres of forested wetlands in the Plan Area (Table 7). Inventory and classification of wetlands during Plan implementation will refine Simpson's estimates of the number of acres by wetland and conservation area type (Section 5.2.3.1). The Stillwater River area of the ROP has an unusually high density of wetlands with numerous small channels connecting wetland features and the stream system. Although this area only encompasses about 5 percent of the Plan Area, it has about 20 and 31 percent of the non-forested and forested wetlands respectively.

The wetland management prescriptions combine an advanced classification system (as applied to forest practice regulation) with a solid approach to functional protection. Simpson's Wetland Conservation Program will be complemented by an assessment and monitoring approach to wetland function that will be stratified by wetland class and sub-class (Table 5). Road management around wetlands in the Plan Area will emphasize the minimization of sediment delivery to wetlands and the maintenance of natural flow patterns, which should stabilize water levels. In addition, the occurrence and spread of exotic plants will be monitored. Simpson's wetland prescriptions will both protect water quality and hydrologic integrity of its wetlands, as well as further the development of riparian forests with late-seral conditions.

Riparian habitats, adjacent to wetlands and riverine systems, provide some of the greatest wildlife habitat diversity that exists in the Plan Area. At least 50 percent of the forested wetland stem density, currently present, will be conserved during the HCP period. This conservation measure, along with the wider wetland management zones, will help sustain wildlife species populations that rely on riparian habitats for a majority of their life history requirements.

One group of wildlife species that will especially benefit from these HCP wetland conservation measures are the cavity nesting ducks. Cavity nesting ducks (common merganser and wood duck) all require nesting cavities in trees between 17 and 25 inches DBH that are within close proximity to open water wetlands, and some types of major rivers. The conservation measures proposed here will not only conserve those types of habitat that are already present but they also will promote the future development and conservation of such habitat during the Plan period.

For the aquatic species, the lentic association will be the primary beneficiary of the wetlands prescriptions (Table 13). The wetland buffers will provide complex shoreline and riparian habitat, which will benefit commonly occurring amphibians of the ROP (Northwestern and long-toed salamanders, rough-skinned newt and red-legged frog). Improved water quality and stability of the water level during the early spring breeding period may also benefit amphibians, such as the Northwestern salamander that attach egg masses to twigs and debris and require relatively stable water stages for successful embryonic development. Improved water quality and structural diversity of near shore habitat will benefit pond dwelling fish species such as the prickly sculpin, three-spine stickleback and the Olympic mudminnow. Over wintering habitat for juvenile coho and rearing habitat for cutthroat trout (species that also use lentic habitats) will be maintained or improved with time.

6.2.4 Explanation of the Road Management Program

Logging roads are an essential part of any intensively managed forest landscape and are needed for the efficient extraction of timber resources. Simpson has 1,996 total active road miles in the Plan Area (Table 14) which traverse a variety of landscapes and cover approximately 3.7 percent of the land base. Weighted road density for the entire Plan Area today is 4.9 miles per square mile varying between 7.8 in the SIG to 4.1 in the AGL (Table 14).

Table 12. Road mileage by LTU and road type in the Plan Area.

	Lithotopo Unit					
Road Type	**AGL**	**CIS**	**CUP**	**ROP**	**SIG**	**Total**
Abandoned	2.3	4.3	20.3	8.9	11.9	47.8
System	76.2	203.8	143.5	457.0	305.2	1185.8
Spur	65.4	138.1	35.6	399.0	172.0	810.1
Current total	**143.9**	**346.2**	**199.4**	**864.9**	**489.1**	**2043.7**

The Plan Area is not fully roaded, but at this time Simpson is unable to accurately project the number of new roads that will be needed to access certain portions of the Plan Area. On average, it is anticipated that road density will not exceed 6.0 miles per square mile at any time during the plan period.

Logging road construction standards have evolved over the last several decades, and like other private forestland owners, Simpson has roads with a wide range of design standards. A major part of the challenge in reducing the effects of the road system on aquatic resources is to address so-called legacy roads. Legacy roads are those which were built prior to 1974 and constructed to lesser design standards than current roads, and which are generally not used for active haul routes today. Some of these roads are inaccessible, extending well beyond fill failures. Simpson currently has no obligation under state or federal law to treat existing legacy roads. However, as an element of the mitigation to be provided under this plan, Simpson will address many of its legacy roads on a segment-by-segment basis during the road inventory and remediation process described in the prescriptions (Section 5.2.4.1).

Table 13. Linkages between aquatic species, their habitats, riparian strategies, management prescriptions and expected benefits.

Aquatic Species Associations	[1]Distribution by LTU (Primary)	Distribution by Channel Class (Primary)	Functional Habitat Elements	Aquatic Resource Objectives[2] Particularly Important to Species Association	Applicable Riparian Strategies	Management Prescriptions Delivering the Most Benefits	Expected Benefits
Headwater RHOL ASTR DICO PLVA	CUP SIG AGL	CUP-C1, C2, C3 SIG-Qo1 AGL-Qo1	Loose alluvial cover in steep headwater streams, streamside seeps, woody debris, cool water.	Area wide No. 1, 2, and 3 CUP - No. 7 and 8 SIG - No. 13 (Qo1) AGL - No. 1	Canyon Unstable /Intermittent	Riparian reserves; 5.2.1 (a), (b), (c) Road remediation 5.2.4.2 (b), (c), (d), (e) Road maintenance 5.2.4.3 (all) Road use 5.2.4.4 (a), (b) Road design 5.2.4.5 (a), (b), (c) Unstable slopes; 5.2.5 (a), (d) Hydrologic maturity; 5.2.6	Streamside seeps will be protected (RHOL), riparian habitat sufficient to supply woody debris for the maintenance of alluvial cover in steep channels will be protected and developed (RHOL, DICO, ASTR), detrital sources for support of lower trophic levels will be maintained (DICO), shade sufficient to maintain cool water temperatures will be retained (RHOL, ASTR), the incidence of road related debris flows will be reduced, management related landslides will be virtually eliminated, and the storm water runoff pathways of small streams and basin hydrology will be maintained in a relatively natural state (RHOL, DICO, ASTR).
Steep Tributary ONCL COCO PLVE	AGL CUP	AGL-Qo1 CUP-C2, 3, 4	Alluvial cover in steep headwater streams, woody debris, diverse channel bed topography including pools, cool water, structurally diverse riparian forests.	Area wide No. 1, 2, and 3 AGL - No. 1 CUP - No. 7 and 8	Unstable /Intermittent Canyon	Riparian reserves; 5.2.1, (a), (b) Road remediation 5.2.4.2 (b), (c), (d), (e) Road maintenance 5.2.4.3 (all) Road use 5.2.4.4 (a), (b) Road design 5.2.4.5 (a), (b), (c) Unstable slopes; 5.2.5 (a), (d) Hydrologic maturity; 5.2.6	Scour caused by debris flows initiated by failures occurring in the headwater first and second order channels will be reduced (ONCL, COCO), diverse channel bed topography will be maintained and developed through the recruitment of large logs (ONCL, COCO), quality of breeding habitat for sculpins under cobbles and boulders will be maintained (COCO), patches of pebbles for cutthroat spawning will be preserved behind obstructions (ONCL), shade will be maintained through a diverse riparian vegetation (ONCL, COCO), when naturally unstable side slopes fail they will bring with them a legacy of large woody debris for habitat development (ONCL, COCO), micro-climate of riparian areas and stream side seeps will be protected (PLVA).
Flat Tributary ONKI ONKE COGU COAL COPE RHOS LARI	ROP AGL CIS SIG	ROP-Qc2, Qc3, Qc4, Qc5, Qc6 AGL-Qo4, Qo5, Qo6, Qo7 CIS-Qc2, Qc3 SIG-Qa6, Qo2, L2, M2, M3, M4, M6	Pool habitat, woody debris cover, stable spawning gravels, cool water, structurally diverse riparian forests.	Area wide No. 1, 3, and 4 ROP - No. 9 and 10 CIS - No. 4, 5, and 6 CUP - No. 7 SIG - No. 12 AGL - No. 2 and 3	Temperature Sensitive Break in Slope Channel Migration Alluvial/Bedrock Reverse Break in Slope	Riparian reserves; 5.2.1, (a), (b) Road remediation 5.2.4.2 (b), (c), (d), (e) Road maintenance 5.2.4.3 (all) Road use 5.2.4.4 (a), (b) Road design 5.2.4.5 (a), (b), (c) Unstable slopes; 5.2.5 (a), (d) Experimental mitigation 5.2.7 (a), (b)	Sediment supply from the upper watersheds will be reduced which will improve pool habitat over the long term (ONKI, RHOS), stabilize spawning gravels and prevent streambed scour (ONKE), this same reduction in coarse and fine sediment over time will result in gravels with a smaller fraction of fine particles which will improve survival to emergence of large bodied salmonids (ONKI, ONKE), interstitial breeding habitat for sculpins will be maintained and improved with a lower sediment supply (COGU, COPE, COAL), woody debris recruitment will be maintained and increased over time promoting development of structurally diverse and complex stream habitat with low pool spacing in moderate to low gradient plane bed/ forced pool riffle channel types (ONKI, COGU, COPE, COAL, LARI), shade will be sufficient to prevent elevated temperatures due to canopy loss (ONKI).
Mainstem ONTS ONMY ONGO SACO SAMA CORO RHCA LATR LAAY BUBO	AGL SIG ROP	AGL-Qa6, Qo8 SIG-Qa6, L4, L5 ROP-Qc7, Qc8	Stable spawning gravels, adult holding pools, complex floodplain and off-channel habitat, complex edge habitat, large woody debris complexes.	Area wide No. 1 and 3 SIG No. 14 CUP- No. 7	Channel Migration Inner Gorge	Riparian reserves; 5.2.1, (a) and (b) Road remediation 5.2.4.2 (b), (c), (d), (e) Road maintenance 5.2.4.3 (all) Road use 5.2.4.4 (a), (b) Road design 5.2.4.5 (a), (b), (c) Unstable slopes; 5.2.5 (a), (d)	Large logs will be recruited from streamside riparian forests promoting complex edge habitat (ONMY, BUBO), diverse floodplain and lower terrace riparian habitat will be preserved (BUBO), sediment and organic retention functions and hyporheic functions will be maintained, diverse streambed topography will be maintained including rearing habitat for juvenile salmonids and other non-salmonid fishes (CORO, RHCA) and deep resting pools for adult steelhead and salmon (ONMY, ONTS, SACO, SAMA), inner gorge surfaces will not be destabilized through management activities, overall sediment bedload to the main rivers will be reduced from the tributary network stabilizing spawning habitat over time (ONTS, ONMY, ONGO, LATR, LAAY).
Lentic COAS NOHU GAAC AMGR AMMA RAAU	ROP	Various wetlands types[3]	Structurally diverse riparian forests, structurally complex wetland habitat, good water quality.	Area wide No. 1 and 3 ROP - No. 11	Wetlands	Wetland inventory 5.2.3.1 Wetland protection; 5.2.3.2 Road remediation 5.2.4.2 (b), (c), (d), (e) Road maintenance 5.2.4.3 (all) Road use 5.2.4.4 (a), (b) Road design 5.2.4.5 (a), (c)	Wetland water levels will not be altered through piracy or addition of water through ditches, stabilizing littoral habitat for pond breeding amphibians and fishes, water quality will be improved by reducing road surface erosion, invasive plant species will be monitored, riparian forests will be protected and developed, significant forested wetland acreage will be maintained (NOHU, GAAC, AMGR, AMMA, RAAU).

RHOL: Olympic torrent salamander; ASTR: Tailed frog; DICO: Cope's giant salamander; PLVE: Western redback salamander; ONCL: Cutthroat trout; COCO: Shorthead sculpin; PLVA: Van Dyke's salamander; ONKI: Coho salmon; ONKE: Chum salmon; COGU: Riffle sculpin; COAL Coast Range sculpin; COPE Reticulate sculpin; RHOS Speckled dace; LARI: Brook lamprey; ONTS: Chinook salmon; ONMY: Steelhead trout; ONGO: Pink salmon; SACO: Bull trout; SAMA: Dolly varden; CORO: Torrent sculpin; RHCA: Longnose dace; LATR: Pacific lamprey; LAAY: River lamprey; BUBO: Western toad; COAS: Prickly sculpin; NOHU: Olympic mudminnow; GAAC: Three-spine stickleback; AMGR: Northwestern salamander; AMMA: Long-toed salamander; RAAU: Red-legged frog

[1] Not an exhaustive description of species distribution but constitutes the principal LTUs and channel classes where the species occur within the Plan Area.
[2] Refer to Section 6.1 for explanations.
[3] See Section 5.2.3 Table 4 for explanation.

Table 14. Current active system and spur road miles in the Plan Area and associated road densities

LTU	Current Miles	Road Density
AGL	141.6	4.1
CIS	341.9	7.1
CUP	179.1	4.1
ROP	856.1	4.7
SIG	477.2	7.8
Total	**1,995.9**	**4.9**

Implementation of the road management prescriptions will reduce chronic fine sedimentation of streams and the catastrophic failure of road fills and sidecast that generate and propagate hillslope and channel failures. These improvements are anticipated to be the direct outcomes of the road prescriptions and should result in more stable habitat and supplement the ecological benefits derived through heightened riparian forest function (Section 5.2.1). Less coarse sediment will be transported to fish bearing portions of the channel network and consequently more pool habitat of a better quality will be maintained. In the non-fish bearing segments of the channel network, woody debris structures and alluvial cover of the bedrock will be maintained, without which the stream breeding amphibians have little rearing and breeding substrate.

6.2.4.1 Road Inventory

The primary benefit from the road inventory program will be a systematic examination of the entire road system. This process will generate information about road segments and channel crossings that need remedial maintenance work or complete decommissioning. A framework will be constructed for the overall assessment of the impacts of the road system. As a result of this work, road problems that would otherwise have impacted aquatic resources of especially high value or having other unique values, will be treated immediately.

6.2.4.2 Road Remediation

Through the road inventory process, Simpson will identify a permanent road system, which is necessary for forestry operations. Roads that will be candidates for decommissioning are: 1) roads not needed for current and anticipated future operations, 2) roads that have a high risk of failure and/or delivery of sediment to streams, and 3) roads located in riparian areas.

Simpson has four years of experience decommissioning roads and has finished 20 miles in the CUP since 1995. Road decommissioning work is expensive but once completed, virtually returns the land to natural hydrologic and hill slope function. Simpson expects to continue road decommissioning as an ongoing aspect of its road management program subject only to the schedule identified in the Section 5.2.4.2 and resource limitations identified in Section 10.5.1. Simpson is required to have all the road remediation projects completed by year 15 of Plan implementation with 75% being completed in the first 10 years. Since the projects will be prioritized based on the level of risk to the aquatic resources, it is expected that correlative risk levels will be reduced substantially in advance of the numeric project schedule. The headwater species association will benefit from the reduction in the number of road-associated debris flows, which scour alluvial cover and woody debris from headwater streams in the CUP leaving a bedrock channel. The recovery of alluvial cover and woody structure in “torrented” headwater channels is slow and the prevention of debris flows and the attendant loss of intact headwater channel habitats is a significant benefit for all species of stream breeding amphibians. The steep and flat tributary species associations also will benefit because debris flows that are caused by roads often propagate through steep highly confined tributaries and run out in the flatter segments where these species reside. These run out zones can be substantially altered causing the loss of habitat structure and woody debris cover. In extreme cases, these reaches may accumulate so much sediment that surface flow is lost during the summer, eliminating all rearing habitat for fish.

6.2.4.3 Road Maintenance

Current operational problems (those identified mainly in areas of active haul) will be handled through a variety of methods, all with the goal of reducing sediment input to streams. Methods used will focus on operationally appropriate solutions and could include but are not limited to, temporary cessation of haul, better road surfacing, improved road drainage features, and sediment trapping techniques. The focus of Simpson's road maintenance activities will be on fixing the cause of the problem, not merely addressing the symptoms. For example, if an in-board ditch is found to have been eroded, the ditch line may need to be armored. However, Simpson will also address the cause of the problem by reducing the amount of water the ditch carries. This could be accomplished by adding more cross drains, constructing driveable dips, outsloping the road or undertaking other appropriate management efforts designed to minimize the chance that the problem will recur.

Primary benefits from the road maintenance program will come as a reduction in fine sediment delivered to streams, elimination of longstanding emergency repair problems, and the retention of more woody debris within the stream system. These benefits will primarily accrue to the flat tributary species association since that is where much of the fine sediment may settle out.

6.2.4.4 Road Use

Road closures were designed to be a principal benefit to wildlife species, especially elk (see Section 6.3.6.1). However, road use is the main factor causing surface erosion of roads and any limitation on road use has the potential to benefit aquatic species through a reduction of fine sediment delivered to streams. This may be especially helpful to the headwater species association, particularly tailed frog and Cope’s giant salamanders that need interstitial space between and beneath cobbles for breeding and rearing. Further downstream in the flat tributary association habitats, sculpin will benefit from the reduction of fine sediment which can cause the channel bed to become “embedded”, that is the larger clasts are embedded within a matrix of fine sediment, preventing access to voids in the stream bed for breeding and egg nest establishment. This same reduction of fine sediment has positive benefits for salmonid spawning habitat.

6.2.4.5 New Road Location, Design, and Construction

New roads will be constructed to standards that minimize their impacts on natural channel function and the free movement of fish. Stream crossings will receive special attention in the prescriptions (Section 5.2.4.6 (c)), due to the risks of creating disconnects in the fluvial transport of materials and the passage of fish. The steep and flat tributary species associations will be the principal beneficiaries of results that will come from the implementation of new road construction standards. Free movement of juvenile salmonids will be preserved, the sediment production from new roads will be substantially reduced, and the risk of future failure of road fills should be virtually eliminated.

6.2.5 Explanation of the Unstable Slopes Management Program

The Plan Area has a wide range of slope stability conditions, some of which can be aggravated by forest management activities. Simpson will control management influences on hillslope instability by identifying unstable slopes and avoiding management activities that could trigger mass wasting processes. Simpson personnel will analyze slope stability issues for all harvest units and road layout and building during the normal course of operations. A qualified geo-technical expert (see Section 5.2.5(c)) will be retained when uncommon circumstances are encountered in high risk areas.

Simpson has conducted Washington State Watershed Analyses pursuant to WAC 222-22 in three Watershed Administrative Units: Kennedy Creek, West Fork Satsop River, and the South Fork Skokomish River. These three watershed analyses were conducted on landforms that represent slope stability issues found in four of the five LTUs in the Plan Area. Only the AGL is not represented in these analyses. The ROP is underrepresented but the slope stability issues that exist in this LTU are well covered by the analyses of the glacial landscapes covered by the South Fork Skokomish analysis. Other areas of the ROP are virtually devoid of slope stability issues. Fortuitously, the AGL has the fewest mass wasting issues of all the LTUs except the ROP. These analyses have been conducted by professional geologists specializing in fluvial and hillslope processes and the reports have been scrutinized through a peer review process. Simpson will utilize all of the information in the watershed analyses for purposes of delineating unstable slopes. However, no timber will be harvested from unstable slopes under HCP management, even if some of the former prescriptions provide for limited harvest of timber.

Pursuant to Section 5.2.5 Simpson will complete a slope stability analysis for the entire Plan Area. In the interim, and for areas yet to be formally analyzed, Simpson will apply the information on mass wasting processes from the formal analysis units. For example, due to similar geology, landforms and mass wasting processes, the West Fork Satsop River analysis can be applied to the Middle Fork Satsop River and its tributaries; the analysis of the basalt geology mass wasting issues from the South Fork Skokomish River are directly applicable to the CUP; and the Kennedy Creek analysis provides useful mass wasting information applicable to other areas of the CIS that are not yet under formal analysis.

Principal benefits to be derived from the application of the Unstable Slope Management Program (5.2.5) are a reduction in delivery of coarse and fine sediment to a wide array of channel classes. These delineation procedures and the HCP prohibition of timber harvest will directly benefit every aquatic species associations through a reduction of immediate site level and long term basin level cumulative effects. In particular, the flat tributary species association will enjoy improved breeding habitat. For coho and chum salmon this means less fine sediment in streambed gravels and for the cottid species it means more open interstitial space beneath cobbles and boulders for nesting and egg incubation. Pool habitat will be deeper if less coarse sediment is delivered to low gradient streams and channel geometry will be maintained within limits conducive to cooler water temperatures.

6.2.6 Explanation of Hydrologic Maturity Prescriptions

The harvest of timber in the CUP has the potential to alter stream hydrology through influences on snow accumulation and snow melt during rain-on-snow events (ROS). In the ROS zone, the lack of a forest canopy (> 70 percent crown closure) allows more snow to accumulate on the forest floor and less to be trapped in the canopy where it is evaporated directly back to the atmosphere before it has an opportunity to become surface water runoff. As referred to here, the ROS zone is an elevationally defined region (1,200-4,000 feet above mean sea level) where snow is more likely to accumulate and then rapidly melt during rainstorms. An increase in peak flows due to increased snow melt runoff in the ROS zone can cause damage to stream habitat through increased scour of the channel bed or erosion of the channel banks. Both of these processes can substantially disrupt the incubation environment of fall spawning salmonids and limit their reproductive success. These same processes can cause damage to rearing habitat through erosion.

Simpson has evaluated the Plan Area for sub-basins that lie within the ROS zone and has identified seven sub-basins of the CUP which can be managed for hydrologic maturity (Table 6). Application of the hydrologic maturity prescriptions identified in Section 5.2.6 should result in sufficient mature forest canopy cover to avoid peak flow damage due to ROS issues. The forest cover thresholds identified in Section 5.2.6 were developed through hydrologic analyses preformed for the south Fork Skokomish watershed analysis and have received both a peer review and public SEPA comment (Rhett Jackson, analyst, 1996).

The road system can also intercept water as it falls directly on the road surface and from road cuts during storms. This intercepted water is routed through the watershed relatively quickly if the road system is highly connected to the channel network, and may cause increases in peak flows or decrease the time to peak flow. Prescriptions in Section 5.2.4 will minimize potential impacts to stream hydrology from these processes through the use of frequent cross drains and other measures to keep water from being routed quickly through the ditch system to streams.

The headwater species association will benefit directly because the management prescriptions (and additional mitigation provided through road remediation as described in Section 5.2.4.2) will decrease the frequency of storm flows capable of shifting instream structures that stabilize their rearing and breeding habitat (Table 13). Tailed frog larvae spend a winter in headwater streams in the Plan Area, exposing them to potentially damaging peak flows. Cope’s giant salamanders are primarily neotenic within the Plan Area (Simpson has observed only two terrestrial morphs, Simpson unpublished data), and so will be substantially protected by the elimination of management influences on headwater stream hydrology. The steep tributary species association will also benefit from the Hydrologic Maturity management prescriptions through the elimination of management influences on peak flows. Downstream benefits will accrue to the flat tributary species association through the lessening of coarse and fine sediment transport to their habitats. This will improve both the quality of the spawning gravels for species like coho and chum and improve the character of pool habitat for those members of the association that spend extended periods of time rearing in freshwater (e.g. coho and riffle sculpin).

6.2.7 Explanation of Experimental Management

Two legacies that persist from the first logging in some parts of the Plan Area are the lack of woody debris in some channels, and hardwood or young conifer dominated riparian forests. While not pervasive, these conditions occur with enough regularity to warrant attention. These conditions have been created by a variety of causes including: logging of riparian forests, misguided stream clean out programs, cedar salvage, and natural successional pathways associated with a variety of riparian settings.

Simpson will engage both these subjects on a pilot project level to determine if any operationally practical prescriptions may be identified to hasten stream and riparian conditions favorable to fish and wildlife. The habitat monitoring program will generate information about the distribution of these conditions by channel class to provide a landscape context. The principal beneficiaries of this kind of research will be the flat tributary species association since the lower gradient tributaries were the most affected by the practices mentioned above (Table 13). Significant benefit could potentially accrue for salmonid species or age classes that rely on pool habitat (e.g. coho and older year classes of cutthroat and steelhead parr).

6.2.8 Explanation of Supplemental Prescriptions due to Changed Circumstances

Since it is impossible to predict the spatial or temporal patterns of natural disturbances that will be addressed by the changed circumstances prescriptions, benefits are difficult to specify except in general ways. The principles that have been established for dealing with operations in the face of "changed circumstances" however, will promote the maintenance of natural disturbance legacies such as snags, downed wood, and structural diversity of stream and riparian systems. These are valuable and long lasting components of natural landscapes that benefit multiple wildlife species. All of the species addressed by this HCP may at some time be favorably impacted by the contingencies established pursuant to Section 5.2.8 but in particular snag dependent bird species and amphibians that use downed wood may be especially benefited.

6.3 EXPLANATION OF SPECIFIC WILDLIFE SPECIES CONSERVATION MEASURES

6.3.1 Marbled Murrelet

In Washington and Oregon marbled murrelets nest, almost exclusively, in large trees (greater than 32 inches DBH) typically within old-growth (greater than 120 years old) or older-age coniferous forests. These forests provide large limb structures for nest substrates, multi-level canopies for in-stand flights, and adjoining trees that provide hiding cover from predators and protection from winds. Murrelet nesting also usually occurs below 3,500 feet elevation and within 35 miles of coastal waters. The amount of murrelet nesting habitat in Washington and Oregon has declined during the past 40 years partially as the result of timber harvest on public and private lands. Habitat remaining in low elevation areas may be critical to the long term survival of this species. As part of this plan, Simpson has agreed to conserve all murrelet nesting habitat within the RCR and all murrelet nesting habitat outside the RCR (identified in Figure 5) that is shown to be occupied with surveys.

The Plan Area was assessed for murrelet habitat in 1995 (refer to Appendix A for a description of the methods). Results of that work show currently there are 598 acres of murrelet habitat within the RCR that will be conserved during the plan period (Figure 8). An additional 540 acres of habitat exists outside the RCR that may be conserved if surveys show those stands to be "occupied" by murrelets. Additionally, we expect that during the 50 year period other coniferous stands in the RCR will develop into murrelet habitat to provide an additional 162 acres of habitat by year 2024, and 1,231 acres by year 2049 (Table 15). Total murrelet nesting habitat at the end of the plan period is expected to be at least 1,991 acres (not including any of the 540 acres of habitat outside the RCR that may or may not be occupied).

Simpson began implementing two-year marbled murrelet surveys at 17 survey sites in 1998. Two-year surveys also were initiated at an additional 23 survey sites in 1999. These 40 survey sites encompass all murrelet habitat known to exist in the Plan Area, as identified during the 1995 habitat surveys. These surveys consist of at least 10 surveys per survey site, and the surveys are being conducted according to PSG protocol as described in Section 5.3.1. All surveys will be completed during Year 2000. As of August 1999 occupied murrelet behavior had been recorded at two survey sites in the Wynoochee River Valley. Murrelet presence also had been detected at four other sites in that drainage.

Table 15. Coniferous forest greater than 70 years of age in the RCR in relation to known and estimated future potential murrelet nesting habitat.

Forest Age Class in 1998 (Year 1)	Total Acres in 1998	Acres of Murrelet Habitat in 1998	Potential Acres of Habitat in Year 25	Potential Acres of Habitat in Year 50
71-100	2,461	0	0	1,231
100+	921	598	162	0
Cumulative Total Habitat		598	760	1,991

This table does not include the 540 acres of known murrelet habitat outside the RCR that will be conserved if surveys show them to be "occupied" stands. Additionally, potential habitat in the RCR, at Year 25 and 50 of the plan period was estimated by assuming that a minimum 50 percent of the coniferous forest greater than 120 years old, that is not currently classified as murrelet habitat, would most likely become murrelet nesting habitat. The rate of murrelet habitat development was limited to 50 percent of stands greater than 120 years old in order to take into account uncertainties in habitat quality, such as stand size and forest fragmentation.

6.3.2 Bald Eagle

Bald eagles typically nest in older and large (greater than 32 inches DBH) dominant or co-dominant trees within old-growth or older-age coniferous forests. These nest sites are usually near foraging areas, such as lakes, streams and coastal waters. Human activities near nest trees can cause eagles to abandon nests or result in reduced productivity (Anthony et al. 1982). Trees, other vegetation and topographic relief surrounding the nest tree can help reduce disturbance caused by humans and also provide protection from adverse weather. Anthony and Issacs (1989) recommend that habitat alterations (such as timber harvest) should not occur within 2,600 ft of nests. Refer to Appendix A for further details of the eagle life history.

Wintering bald eagles typically concentrate in areas where food is abundant and disturbance is minimal. The eagles will perch near food sources (e.g. lakes, streams and coastal waters) during the day and move to communal roost sites during the evening. Eagles may gather at staging areas (larger trees protruding above the forest canopy) between their foraging areas and the roost areas, prior to entering the night roost. Communal roost sites are generally in uneven aged forests with multilevel canopies. Specific trees used for roosting appear to be selected for their ability to shelter eagles from inclement weather, such as wind and rain, and from disturbances.

The communal roost site near the confluence of the North Fork and South Fork Skokomish Rivers has not been surveyed or intensively studied. Periodic observations made during the 1980's and 1990's, however, indicate that as many as 30 eagles roost in this area, and that they use a staging area in Section 6, Township 21, Range 4 (Schroer, pers. comm. 1997). As part of this plan, Simpson has agreed to develop a bald eagle management plan for this particular communal roost site, which will include lands within the North Fork Skokomish River LFR.

6.3.3 Band-tailed Pigeon

The band-tailed pigeon is a neo-tropical migrant species that inhabits the Plan Area during the spring through fall seasons each year. This species nests in a wide variety of forests; primarily older than 30 years of age (Appendix A) at elevations less than 1,000 feet. Within the Plan Area, nesting habitat does not appear to be a limiting factor. Mineral springs are also important to this species, especially during the breeding season; however, no mineral springs are known to exist in the Plan Area (Appendix A). Specific management that Simpson can implement to help conserve band-tailed pigeons is the conservation of their forage plants. Within the context of Simpson's forest management, it is impossible to conserve all forage resources; however, as part of this plan, Simpson will refrain from targeting herbicides on primary forage plants in the areas with the greatest abundance of such resources, as described in Section 5.3.3. Simpson personnel provide aerial spraying operators with maps of areas that shall be avoided when herbicide spray is applied (i.e. surface water, wetlands and public water sources). The same requirements would apply for band-tailed pigeon forage areas identified in Section 5.3.3 and the acreage and location of forage areas avoided will be documented and reported pursuant to Section 8.

6.3.4 Harlequin Duck

Harlequin ducks rely on a variety of riparian vegetation for nesting and the streams and rivers for foraging. The RCR program will help ensure most, if not all, the nesting habitat of this duck is maintained and in some cases enhanced through time. Additionally, nesting harlequin ducks will be protected by instituting the closures identified in Section 5.3.4 immediately after a nest site is confirmed. These closures will remain in effect until the ducks have fledged their young. Reducing activity near the nest site during the incubation and fledging period will reduce the chance for inadvertent disruption of the nesting birds, which could result in the abandonment of the nest. Refer to Appendix A for more detail regarding this species.

6.3.5 Roosevelt Elk

6.3.5.1 Road Closures

Currently Simpson has an ability to restrict motor vehicle access to 12 areas in the Plan Area, totaling 135,033 acres (52 percent of total Plan Area) (Table 17 and Figure 9)[15]. At a minimum, Simpson will maintain year-around closures to all public motorized traffic in areas 1, 2, 3, 7, 9, and 12, or other areas which total at least that same amount, which is approximately 36,000 acres. These roads will be closed to all traffic other than that which is related to Simpson business, and the closed areas will remain closed throughout the year except when they need to be opened as required by law. The road closure program is conditional upon the MOU referenced in Section 5.3.6(b).

Research has shown elk tend to avoid areas with road motor vehicle traffic (Marcum 1975, Hershey and Leeg 1976, Perry and Overly 1976, Rost and Bailey 1979, Whitmer and DeCalestra 1985). This avoidance behavior results in a decreased capacity of the land to support elk because of less habitat availability and higher stress levels (Lyon 1979, 1983; Pederson 1979). Research conducted by Leptich and Zager (1991) showed higher bull mortality rates (61.7%) in highly roaded areas than the rate (31.3%) in areas with few roads. Additionally, only 5 percent of the bulls in the highly roaded areas lived to maturity and none lived more than 5.5 years, whereas in areas with road closures 16 percent of the bull population consisted of mature animals and the average life span was 7.5 years. This impact and loss to elk populations resulting from road access can be minimized by closing roads to nonessential traffic.

---

[15] An additional 7,344 acres of timberlands owned by third parties adjacent to Simpson lands are also regularly closed to the public.

Table 16. Linkages between wildlife species, resource objectives, management prescriptions and expected benefits.

Species	Wildlife Resource Objectives (Described in HCP Section 4.2)	Management Prescriptions (Described in HCP Section 5)	Expected Benefits
Marbled Murrelet	Riparian conservation (Objective 1) Late-seral forests (Objective 2) Specific species mgmt. (Objective 4)	Conserve riparian habitat: 5.2.1 Conserve existing and future habitat in RCR: 5.3.1 (b) (d) Conserve occupied habitat outside RCR: 5.3.1 (c) Limit harvest in buffers: 5.3.1 (e) (f) (g)	All occupied habitat in and outside RCR will be conserved. At least 1,400 acres of additional nesting habitat are expected to develop in the RCR and they will be conserved. Most buffers of occupied habitat protected, and potential management disturbances will be minimized.
Bald Eagle	Riparian conservation (Objective 1) Late-seral forests (Objective 2) Specific species mgmt. (Objective 4)	Conserve riparian habitat: 5.2.1 Conserve wetlands: 5.2.3 Conserve nests: 5.3.2 (b) Conserve communal roost: 5.3.2 (b)	All nest sites will be conserved. Most existing and future perch sites along rivers and wetlands also will be conserved. A management plan will be developed to conserve the communal roost site.
Band-tailed Pigeon	Riparian conservation (Objective 1) Late-seral forests (Objective 2) Specific species mgmt. (Objective 4)	Conserve wetlands: 5.2.3 Protect wetlands from herbicide: 5.3.5 (a) Protect forage plants: 5.3.5 (b)	Wetlands can contain a high abundance of forage species for this pigeon and the wetland conservation of this plan will help conserve these resources. Herbicide spraying in and near wetlands will not occur, which will help maintain forage species. Additionally, areas with high concentrations of forage species in the uplands will also be protected from herbicide spraying.
Harlequin Duck	Riparian conservation (Objective 1) Late-seral forests (Objective 2) Specific species mgmt. (Objective 4)	Conserve riparian areas: 5.2.1 Conserve wetlands: 5.2.3 Limit mgmt. disturbances: 5.3.6 (b)	Riparian areas will be conserved to ensure adequate protection of nesting habitat. Potential management disturbances to nest sites also will be minimized.
Roosevelt Elk	Riparian conservation (Objective 1) Late-seral forests (Objective 2) Specific species mgmt. (Objective 4)	Conserve riparian areas: 5.2.1 Close roads to public access: 5.3.7 (b) Seed forage species: 5.3.7 (c)	Riparian areas conserved, and these areas contain many habitats preferred by elk (deciduous bottomland forests, riverine meadows and mixed forests). Roads across at least 30,000 acres will be closed to nonessential traffic, which will increase habitat availability and decrease illegal hunting losses. Forage seeding will provide high levels of nutrient availability in limited areas.
Snag Dependent Species	Riparian conservation (Objective 1) Late-seral forests (Objective 2) Specific species mgmt. (Objective 4)	Conserve riparian areas: 5.2.1 Conserve wildlife trees: 5.2.2 Conserve wetlands: 5.2.3	Riparian and wetland buffers (including forested wetlands) are snag rich areas that will be conserved for the plan duration. Larger size snags also will be recruited as a result of this conservation. Single and small groups of wildlife trees also will be conserved across the HCP landscape to provide for some upland snag distribution.

The purpose of road closures is to increase the availability of habitat to wildlife species, reduce illegal hunting and reduce surface erosion of roads. This program will provide direct benefits to many wildlife populations, particularly large mammals that are hunted, including elk, deer, bear, cougar and bobcat. Additionally, road closures will have direct benefits to aquatic ecosystems and the species covered by the ITP, through a reduction in road use which is a primary cause of road surface erosion.

Road Closure Area Number	Acres of Simpson Ownership	Acres of Other Ownership
1	9,729	1,178
2	10,002	48
3	5,443	313
4	30,929	343
5	18,464	1,788
6	8,118	149
7	5,548	0
8	7,388	5
9	3,049	510
10	26,423	1,441
11	7,698	704
12	2,242	2
Total	**135,033**	**6,481**

Table 17. Summary of areas, and the acreage, which will have Simpson roads closed to public motor vehicle traffic.
Figure 9 shows the location of these road closure areas.

6.3.5.2 Forage Seeding

A herbaceous seeding program will be implemented on 50 percent of the deactivated roads in road closure areas 1, 2, 3, 7, 9, and 12. This will provide high quality forage “core areas” in the Plan Area for Roosevelt elk and to a lesser degree, black-tailed deer. Forage seeding provides an effective means for supplementing elk nutrition and energy reserves, which can result in higher population survival, recruitment and reproductive rates. This seeding will be accomplished on roads and landings that are permanently closed to motor vehicle use. Seeded roads and landings typically retain herbaceous plants longer than in harvest units, because young coniferous stands reach stand closure at approximately 18 years of age, which eliminates most herbaceous understory.

6.3.6 Snag Dependent Species

Another primary wildlife habitat conservation goal of this HCP is to conserve and develop snag habitat. This type of habitat, particularly the larger size classes, is currently less abundant than it was historically. More than 50 bird and mammal species have evolved a dependence on such habitat for foraging, nesting, roosting, and denning. With the advent of industrial forestry in this century, these types of wildlife habitat structures were progressively removed from the landscape. With shorter timber harvest rotations and more efficient use of each acre, older trees and those with decadence have become a rarity. The scarcity of this habitat continues today in many low elevation forests of western Washington, except generally for snags less than approximately 12 inches DBH.

During 1996 Simpson conducted forest inventories at 30 sites distributed throughout the proposed RCR (Appendix E). Results of this initial assessment showed an average of 7.9 conifer snags per acre in the RCR of which 5.7 were between 4 and 12 inches DBH, 1.06 snags per acre were.12-24 inches DBH, and 1.14 snags per acre were greater than 24 inches DBH. Simpson will conserve existing snag habitat in the RCR and also conserve snags and potential snags, through other programs such as the wildlife tree conservation program and the wetland conservation program, which will conserve at least 50 percent of the forested wetlands.

A majority of the species addressed by this plan require snags in the medium and small size classes (refer to Appendix A for descriptions). The number and type of existing snags in the RCR and other areas, such as wetlands, combined with the development of future snags through conservation measures (e.g. minimum of 8 leave trees per acre of each section of land) will ensure these species populations are maintained in the Plan Area.

As part of this effort, Simpson will inventory the quantity and quality of snags in the RCR during the plan period. These inventories will be a statistically valid sampling of forests adjoining each channel class and wetland type.

7 POTENTIAL IMPACTS, MINIMIZATION AND MITIGATION MEASURES

7.1 GENERAL

A required element of all HCPs is a description of the "impacts likely to result from the proposed taking of the species for which permit coverage is requested" (USFWS and NMFS 1996). This requires an identification of the mechanisms whereby impacts may occur and an assessment of the extent of any such potential impacts. This section identifies the potential impact of the permitted activities and includes an evaluation of the consequences of this level of impact on the ability of the covered species to survive and recover in the wild.

The following analysis discusses anticipated impacts of permitted activities rather than focusing only on the effect of actions which might constitute "take" under the ESA. Not all impacts result from "take". Take is narrowly constrained by statue, legal precedent, and agency policy. Identifying "take" for species which are not yet listed and for which no 4(d) regulations or take guidelines have been promulgated is particularly problematic. Moreover, the physical mechanisms that cause impacts are highly variable in time and space. Many adverse impacts will have only tenuous connections to current permitted practices and are more likely the effects of historical legacies and their interaction with natural processes. Adverse consequences that result from preexisting conditions do not constitute a take. By focusing generally on the potential result of all the permitted practices, the following discussion covers the required impacts of any incidental take and more.

This Section also analyzes the minimization and mitigation of impacts that are contemplated by the Plan. The Plan will minimize and mitigate to the greatest extent practicable the impacts of any incidental take to a covered species which may occur as a result of permitted activities. This Plan will ensure that any taking of the covered species will not appreciably reduce the likelihood of such species' survival and recovery in the wild. In many instances the actual effect of implementing the management prescriptions will be more beneficial than avoiding take altogether. Mitigation included in the HCP addresses legacies of past practices and in some instances aspects of the animal's habitat not associated with current operations. In a number of instances, the implementation of the Plan will result in an improvement for covered species beyond what would result from a strict no-take approach.

7.2 POTENTIAL IMPACTS ASSOCIATED WITH THE HCP

7.2.1 Aquatic Species

Stream systems integrate conditions throughout their watersheds and are also affected by reach level factors associated with riparian forests and stream-adjacent hill slopes. Because fluvial systems function in this manner, aquatic species and habitat some distance from proximate causes may be impacted through both direct and indirect pathways. Of course, not all of these circumstances would constitute a take. Set forth below are examples of how impacts could occur for each aquatic species association as a consequence of the permitted activities. A reasoned analysis of the potential extent and consequences of these impacts is also included.

7.2.1.1 Headwater Species Association

The headwater species association is composed of the Olympic torrent and Cope's giant salamanders, tailed frog, and the western redback salamander. Living in or immediately adjacent to headwater channel classes (e.g. CUP-C1 or SIG-L1) occasionally subjects these species to catastrophic physical processes such as shallow rapid landslides and debris flows (Table 18). These kinds of mass wasting events will occur in headwater landscapes even in the absence of forest management activities. However, the potential for increasing the rate and distribution of these events through the interaction of management activities and large natural storm events will always exist in the managed landscape.

Impacts to members of the headwater species association may occur through their direct entrainment into the mass of sediment and wood resulting from a debris flow. Debris flows and landslides can also adversely affect habitat and food resources of these species due to channel scouring and sediment deposition. The loss of alluvial cover in steep headwater channels can be damaging because it can destroy interstitial rearing space and large quantities of deposited sediment may cause streams to lose their surface flow. The Olympic torrent and Cope's giant salamander and the tailed frog are especially susceptible to these kinds of habitat alterations. Debris flows and landslides associated with management activities will be rare under the Plan; however, they may occur. In the event that such mass wasting occurs it will likely be associated with large storms which will likely trigger similar events on unmanaged forest lands.

In spite of a long history of intensive forest management in the Plan Area, stream breeding and riparian associated amphibians are well represented in headwater channel classes in the Plan Area (Simpson Timber Co. unpublished data). These headwater species populations are smaller where debris flows and streamside mass wasting have occurred in the recent past; however, they have not been eliminated. Although it is impossible to predict where, when, or exactly how many of these events may occur, their rate and distribution will be substantially lower and less wide spread than under past management practices. Based on this, Simpson forecasts an improving trend in the condition of habitat in headwater channels as a result of the implementation of the Plan. Although it will be difficult to measure and will occur over a long time period, this result will also most likely lead to a moderate increase in the numbers of headwater amphibians and somewhat wider distribution. Simpson concludes that any impacts incurred and associated with the permitted activities will be insignificant and largely immeasurable at the LTU or channel class level and in no event will they imperil the recovery of members of this species association in the wild.

7.2.1.2 Steep Tributary Species Association

The steep tributary species association is composed of two species of fish, coastal cutthroat trout ("ONCL") and shorthead sculpin ("COCO"), and one riparian associated amphibian, Van Dyke's salamander ("PLVA"). Members of this species association occur in the steep highly confined tributary channel classes of the CUP and AGL (e.g. CUP-C2, 3, 4, 8; AGL-Qo1).

The principal physical processes affecting the steep tributary environment that could impact these species are twofold: shallow rapid landslides and the transmittal of debris flows through steep highly confined channel segments (Table 18). Steeper tributary streams function as transport systems for wood and sediment derived from headwater channel segments or valley walls. The physical processes described above may harm individuals directly or modify their habitats to the extent that their survivability is compromised. As debris flows travel through a reach, they can locally scour the streambed which can kill incubating eggs and larval fishes and debris laden water can kill free swimming juvenile and adult fishes.

In some reaches that are recovering from historical logging practices or large natural disturbances, the population size of some steep tributary species is reduced but multiple year classes are present indicating reproduction is occurring. Habitat in steep tributary systems in general is resilient to physical effects because it tends to be dominated by bedrock and boulders, which provide stable elevation control at the habitat scale. Conditions overall will be on an improving trend as a result of the implementation of the Plan and it is expected that these systems will continue to develop productively. Any adverse consequences that may be occasioned by the processes characterized above and which relate to any permitted activity will be insignificant and impossible to quantify at the LTU or channel class level and will not impede the recovery of any such covered species in the wild.

7.2.1.3 Flat Tributary Species Association

The flat tributary species association is diverse and includes coho (“ONKI”) and chum salmon (“ONKE”), riffle (“COGU”), reticulate (“COPE”), and coast range sculpin (“COAL”), speckled dace (RHOS”), and western brook lamprey (“LARI”) (Table 1). This species association populates some of the most productive and important fish-bearing channel classes in the Plan Area, including the CIS-Qc3, ROP-Qc3, 5, 6, 7, and AGL-Qo5, 6, 7.

Impacts to this group may occur through the deposit of coarse sediment, the accumulation of fine sediment in spawning gravels, and elevated water temperatures (Table 18). Coarse sediment is delivered to channel classes supporting the flat tributary species association from multiple upstream sources, side slope failures, and lateral erosion of banks and low terraces. Fine sediment is delivered through the same processes and through surface erosion of the running surface and ditch line of forest roads. Water temperatures may be elevated through the reduction of density in the riparian forest canopy and changes in channel geometry associated with coarse sediment accumulation.

Especially large accumulations of coarse sediment in low gradient channels can lead to the loss of surface flow and death of individuals in those reaches while coarse and fine sediment deposited on the channel bed could entomb salmonid larvae. Elevated water temperature may make stream habitat inhospitable to individuals inhabiting these reaches. In the case of temperature, the actual agent of harm may be heightened susceptibility to disease or predation. It is unlikely that temperatures would reach lethal levels even in the most extreme circumstances.

In spite of a long history of intensive forest management in the Plan Area, all of the fish native to Plan Area flat tributaries are well represented today (Simpson Timber Co. unpublished data). Habitat in tributary systems overall will be on an improving trend under HCP management and it is expected that conditions will continue to develop productively for the flat tributary species association. The impacts that may be occasioned by the processes characterized above and which relate to any permitted activity will be insignificant and impossible to quantify at the LTU or channel class level and will not impede the recovery of the covered species in the wild.

7.2.1.4 Mainstem Species Association

The mainstem species association has 10 members including the western toad (“BUBO”), Pacific lamprey (LATR”), and river lamprey (“LAAY”) (Table 1). Other members include chinook (“ONTS”), steelhead (“ONMY”), pink salmon (“ONGO”), and bull trout (SACO”), dolly varden (“SAMA”), torrent sculpin (“CORO”), longnose dace (“RHCA”). Members of this association (and some others not covered by this HCP) do not all occur together in the same segment but often occur as a suite of 6 or 8 species, the composition of which depends on the character of the habitat. Mainstem channel classes include ROP-Qa7, Qc7, 8, SIG-L4, M5, and AGL-Qa6, Qo-8.

Members of the mainstem species association could be impacted in much the same way as those in the flat tributary association; however, the direct linkages to management are more difficult to demonstrate for this group. This difficulty stems from the problems associated with establishing cause and effect relationships between land management and in-channel habitat conditions in large rivers. Impacts could occur as a consequence of management influenced landslides but mass wasting events this large always have large contributing natural factors, such as the lateral erosion of landslide toes by the river. Linkages between management activities and temperature effects in the mainstem environment are tenuous due to the naturally open canopy of large channels.

Not all of the fish native to Plan Area mainstems are well represented today (e.g. Skokomish River spring chinook and pink salmon and Wynoochee River spring chinook are either very rare or have been extirpated). These races of salmon have been subject to significant habitat and fishery pressure over many decades. In the case of the Wynoochee spring chinook the dam may be implicated and fisheries early in the century may have significantly affected Skokomish River pink salmon while little consensus exists on the size or history of the Skokomish River spring chinook run. Habitat in main rivers overall will be on an improving trend under HCP management and it is expected that conditions will continue to develop productively for the mainstem species association (in part due to the lack of forest management activities and the active sediment abatement work in headwater areas on U.S. Forest Service ground; see Section 3). The impacts that may be occasioned by the processes characterized above and are associated with any permitted activities will be insignificant and impossible to quantify at the LTU or channel class level and will not impede the recovery of the covered species in the wild.

7.2.1.5 Lentic Species Association

The lentic species association is composed of three species of fish: the prickly sculpin (“COAS”), threespine stickleback (“GAAC”) and Olympic mudminnow (“NOHU”); and three species of pond breeding amphibians: the Northwestern salamander (“AMGR”), long toed salamander (“AMMA”) and red legged frog (“RAAU”). No significant levels of impact are expected to any of these populations because management resulting from this plan will not directly impact a majority of lentic habitats. Some direct impact could occur as a result of harvesting in forested wetlands. Removal of forest cover in these areas could significantly alter the temperature and moisture conditions during summer months, and under certain circumstances lead to the death of some amphibians. Any such adverse impacts that may occur will not imperil or prevent the recovery of any member of this species association in the wild.

Table 18. Potential impacts to aquatic species associations, habitats, and HCP minimization and mitigation measures.

Aquatic Species Association	*Potential* Impact Mechanisms[16]	Extent of Impact	Minimization and Mitigation[17]	Adverse Impact on Recovery of Species in Wild
Headwater	Loss of functional riparian habitat, increased water temperature, fine sediment accumulation in channel, shallow rapid landslides, increase in frequency of peak flows, road fill failures, debris flows.	Minor	Riparian reserves, 5.2.1; Road maintenance, 5.2.4.3; Road Use, 5.2.4.4; Road design, 5.2.4.5; Unstable slopes, 5.2.5; Hydrologic maturity, 5.2.6; Road remediation[18], 5.2.4.2.	None
Steep Tributary	Loss of functional riparian habitat, increased water temperature, fine sediment accumulation in channel, shallow rapid landslides, increase in frequency of peak flows, road fill failures, debris flows.	No change	Riparian reserves, 5.2.1; Road maintenance, 5.2.4.3; Road Use, 5.2.4.4; Road design, 5.2.4.5; Unstable slopes, 5.2.5; Hydrologic maturity, 5.2.6; Road remediation, 5.2.4.2.	None
Flat Tributary	Loss of functional riparian habitat, increased water temperature, fine sediment accumulation in spawning gravels, coarse sediment accumulation and loss of summer surface flow, loss of pool habitat and woody debris cover, dam break floods and debris flow run outs.	Improve	Riparian reserves, 5.2.1; Road maintenance, 5.2.4.3; Road Use, 5.2.4.4; Road design, 5.2.4.5; Unstable slopes, 5.2.5; Hydrologic maturity, 5.2.6; Experimental mitigation, 5.2.7; Road remediation, 5.2.4.2	None
Mainstem	Loss of functional riparian habitat, shallow rapid and deep seated landslides, chronic delivery of sediment from small tributaries.	No change	Riparian reserves, 5.2.1; Road maintenance, 5.2.4.3; Road Use, 5.2.4.4; Road design, 5.2.4.5; Unstable slopes, 5.2.5; Hydrologic maturity, 5.2.6; Road remediation, 5.2.4.2	None
Lentic	Sedimentation of wetlands, piracy of water and consequent alteration of wetland hydrology, loss of riparian habitat.	Improve	Wetlands, 5.2.3; Road maintenance, 5.2.4.3; Road Use, 5.2.4.4; Road design, 5.2.4.5; Road remediation, 5.2.4.2	None

[16] Depending on the degree of management influence and the degree to which individuals of a covered species are “harmed”, some of these impacts could be construed as “take”.
[17] Numbers refer to Sections of the Plan where prescriptions are described that will provide the minimization and mitigation for potential impact mechanisms.
[18] Road remediation is listed as mitigation for all aquatic species associations because sediment delivery to all of these habitats will be reduced through these activities.

7.2.2 Wildlife Species

The following sections assess the potential impacts of covered activities on wildlife species addressed by the HCP. Impacts are assessed based upon the amount of habitat lost or impaired, or by other impacts, such as the effects of temporal management activities on the species.

7.2.2.1 Marbled Murrelet

This plan will conserve and protect all occupied marbled murrelet habitat outside the RCR, and also murrelet habitat in the RCR regardless of whether it is occupied. Some disturbances could occur to occupied murrelet habitat within the RCRs due to timber harvest that may occur within the 300 ft buffers that fall outside the RCR boundary. This harvest activity, however, would not occur to the first 150 acres of buffer identified outside the RCR. After that threshold is reached we do not expect more than 200 acres of buffer habitat to be impacted by management actions.

A relatively small percentage of occupied murrelet habitat buffers will be impacted by timber management due to the following reasons. Currently there are approximately 36 separate potential murrelet nesting habitat areas inside the RCR or that abut the RCR boundary. An estimated average of 80 percent of the boundaries of these habitats are entirely within the RCR. That leaves only 20 percent of the boundaries that could potentially be harvested. However, given the fact that the first 150 acres of this type of buffer habitat will be conserved, we estimate that all, or most all of these habitat buffers would receive complete buffer protection, if these areas are found to be occupied. This 150 acre threshold could also provide full buffer protection to some future murrelet habitat that develops in the RCR during the plan period. However, that will not be known until surveys are completed and occupied habitat is defined.

The potential removal of up to 200 acres of murrelet habitat buffer (only after the first 150 acres is conserved) could conceivably increase predation rates and expose nests to adverse wind impact for murrelets that may nest in those particular stands. Murrelet chicks or eggs could be affected by this potential habitat degradation, although the amount of total buffer habitat involved is relatively low. More importantly, adult murrelets are not expected to be directly lost by land management resulting from this plan, and minimization and mitigation measures that address the potential impacts to the buffer habitat are described in Section 7.3.2.1.

7.2.2.2 Bald Eagle

This plan will conserve all bald eagle nest sites within the Plan Area. Additionally, it will lead to the development and implementation of a bald eagle management plan that will conserve the bald eagle roost site and staging areas in the North Fork Skokomish River valley. Bald eagles are not expected to be lost as a result of the implementation of the Plan, although some potential habitat loss and temporal management activity disturbances may affect bald eagles near or at the communal roost site. These disturbances could be in the form of: 1) temporal noise disturbances related to timber harvest or road building operations within 0.25 mile to 0.5 mile of the communal roost site or staging areas to that site; or 2) trees or stands of trees used for staging or roosting may be removed by timber harvesting or road building. In some, or possibly all instances, bald eagles may use other nearby trees for staging and roosting if some of that habitat is lost. The specific amount and level of these impacts is not currently known but is expected to be quite small. The permitted activities are not expected to cause any significant impact to the eagle population that nests in the Plan Area, or to the eagles that use the communal roost site and staging area. Mitigation and minimization measures for this potential impact are described in Section 7.3.2.2.

7.2.2.3 Band-tailed Pigeon

Simpson currently harvests coniferous forests at approximately 50-70 years of age. In future years of the plan this harvest age will typically occur between 40 and 50. On average, the annual harvest of timber in the Plan Area will occur on less than two percent of the land. Removal of mature forest habitat is not expected to directly injure or kill any adult pigeons, due to their ability to fly from management disturbances. This management may, however, incidentally remove some nesting habitat, nests, eggs, or chicks each year. Additionally, some incidental loss of foraging habitat could result from herbicide treatments placed on young clear-cut units that may have forage plant species. The potential habitat loss and herbicide spraying, however, is not expected to significantly impact the band-tailed population in the Plan Area. Mitigation and minimization measures that address these potential impacts are identified in Section 7.3.2.5.

7.2.2.4 Harlequin Duck

This plan is not expected to adversely impact harlequin duck populations. Habitat conservation measures, as defined for the RCR, will ensure that adequate nesting and aquatic habitats for this species are conserved and enhanced. Additionally, restrictions placed on potential management disturbances near nest sites will also help ensure this species is conserved in the Plan Area.

7.2.2.5 Roosevelt Elk

The HCP management is expected to provide an abundance of forage and cover habitats for Roosevelt elk. This habitat abundance, combined with the proposed road closures, will help ensure elk populations are sustained and enhanced in the Plan Area. Some elk populations in areas without road closures may be detrimentally impacted by increased elk hunting pressure (as a result of road closures elsewhere in the Plan Area). These potential impacts; however, are not expected to threaten the continued survival and viability of the Plan Area elk population.

7.2.2.6 Snag Dependent Species

The Plan Area contains a variety of forest and snag habitats used by the snag dependent bird species covered by the HCP. These habitats also are present on other private, state and federal lands in the Plan Area vicinity. Many of these bird species also use forest edge habitats, young forests, and non-forested areas for some foraging, and those habitats also are available in the Plan Area and vicinity.

On average, less than two percent of the plan area forests are harvested each year, and future harvests will be conducted with 45-year rotations (regardless of whether the HCP is implemented). Currently there are approximately 67,446 acres of forest more than 50 years old outside the proposed conservation areas, and during the next 25-years that forest will be converted to stands younger than 50 years-old.

Timber harvesting is not expected to directly injure or kill adult birds, due to their ability to fly from those operations. This management may, however, incidentally remove some nesting habitat, nests, eggs, or chicks each year, and temporal noise disturbances could result in nesting failure. Some species may experience population limitations in the plan area due to the loss of older second growth forests (e.g. >50 years old). Some species also may experience competition within and between species for snag habitats concentrated in the RCR and wetland conservation zones.

Although there will be a loss of larger snags and older second growth forests outside the proposed conservation areas, the proposed HCP management will help sustain habitat for these species within the Puget Sound Basin and southeastern portion of the Olympic Peninsula Region. This is particularly important when considering the substantial habitat losses that have occurred in these regions due to urban and residential development. The importance of the Plan Area to the survival of these species populations in the region has not been quantified; however, the Plan Area will continue to provide habitat for these species during the plan period. Specific management measures that minimize and mitigate adverse impacts to these species are defined in Section 7.3.2.6.

7.3 MINIMIZATION AND MITIGATION OF IMPACTS

7.3.1 Aquatic Species

The HCP prescriptions minimize to the greatest extent practicable the impacts of covered activities on the primary inputs and processes that are vital to the maintenance of productive stream habitat. For example, riparian prescriptions are designed to fully protect, with a no harvest buffer, those geomorphic surfaces that have the highest likelihood of contributing logs and woody debris to streams. Shade is likewise maintained at optimal levels, with special attention given to streams that may be susceptible to increases in water temperature due to loss of density in the canopy. The effects of road sedimentation are minimized through a suite of prescriptions designed to eliminate road surface erosion and make sure water is not concentrated in the ditch line. Destabilizing influences of road runoff on steep slopes have been minimized through prescriptions designed to prevent piracy and transfer of water between small basins. The road program will provide substantial mitigation in the form of culvert replacements that will eliminate long standing fish blockages and by decommissioning of road segments that are prone to causing landslides and debris flows. The impact of timber harvest on slope stability will be minimized through the identification of unstable areas and prohibitions on harvest to avoid triggering mass wasting.

Taken together the management prescriptions set forth in Section 5 substantially minimize and mitigate the potential for the impacts and whatever minor amount of take may occur. In fact, the management prescriptions outlined in the HCP reduce the potential for incidental “take” to such a degree that it would be extremely difficult to measure. In any event, the impact of any such “take” should be of such a small consequence that the survival and recovery of the covered species in the wild should be unhindered by activities permitted by the HCP.

7.3.1.1 Headwater Species Association

Potential impacts to the headwater species association will be minimized by: 1) protecting unstable slopes with undisturbed no harvest continuous leave areas (Section 5.2.5), 2) constructing new roads to high standards so that fills will not fail and cause debris flows (Section 5.2.4.5), and 3) leaving discontinuous buffers to act as refugia in areas where no instability occurs in non-fish bearing and non-perennial flow channel segments (Section 5.2.1, Table 18). These complementary conservation practices will combine to maintain undisturbed adult terrestrial habitat, including seeps and springs, and functional breeding and larval rearing habitat in the steep headwater channel classes.

Mitigation of any incidental take will also be provided by the road decommissioning program (Section 5.2.4.2), which will address legacy roads. In the absence of this mitigation, road fills, especially in the CUP especially, would continue to fail, potentially impacting miles of high quality stream breeding amphibian habitat.

7.3.1.2 Steep Tributary Species Association

Impacts to members of the steep tributary species association will be minimized by implementing the RCR prescriptions which will leave substantial undisturbed buffers along channel classes supporting this group (Section 5.2.1, Table 18). Additionally, the requirements associated with unstable slopes will provide additional unmanaged buffers to ensure maintenance of riparian forest function and hill slope stability (Section 5.2.5). Special attention to the design of new roads will have a positive effect by reducing the risk for triggering landslides that typically propagate through steep tributary systems (Section 5.2.4.5). At the small basin level, restriction of harvest rate in the CUP will minimize the possible impacts to habitat from peak flow increases (Section 5.2.6).

Mitigation for incidental take of members of this species association will also occur through the road decommissioning program (Section 5.2.4.2). In the absence of this work fill failures would continue to occur, impacting a substantial amount of steep tributary habitat.

7.3.1.3 Flat Tributary Species Association

Impacts to the members of the flat tributary species association will be minimized by implementing the RCR prescriptions which will leave substantial undisturbed buffers along all of the channel classes supporting this group (Section 5.2.1, Table 18). This will address the temperature issues through well shaded streams, provide sufficient woody debris recruitment for habitat structure, and also maintain roots in the stream banks to resist erosion. The reduction of sediment supply from headwater and steep tributary channel classes will provide additional minimization of impacts from permitted activities.

Mitigation of take for this species association will occur through replacing culverts to allow for fish passage where it is currently blocked (Section 5.2.4.2), conducting research on the addition of woody debris to streams with currently low wood loading (Section 5.2.7), and by keeping wood in the channel network that is removed from the entrances to culverts (Section 5.2.4.3, Table 18).

7.3.1.4 Mainstem Species Association

Impacts to the members of the mainstem species association will be minimized directly by implementing the RCR (Section 5.2.1) and unstable slopes prescriptions (Section 5.2.5). These two prescription categories will maintain slope stability and woody debris recruitment in the short term. In the long term, they are designed to leave timbered surfaces in place that are prone to failure and may deliver large quantities of logs to the main rivers.

7.3.1.5 Lentic Species Association

Impacts to members of the lentic species association will be minimized by implementing the RCR prescriptions (Section 5.2.3.1). These actions will provide undisturbed terrestrial habitat for adult pond breeding amphibians and provide structural elements for eventual recruitment to wetlands. Roads around wetlands will be maintained (Section 5.2.3.2) and constructed to prevent alteration of seasonal water levels and inflow, and minimize sediment runoff.

7.3.2 Wildlife Species

7.3.2.1 Marbled Murrelet

Potential management disturbances to murrelet nesting will be minimized with seasonal and daily limitations placed on those activities, and conservation of nesting habitat. Additionally, management under this plan will promote the development of future murrelet habitat in the RCR, which will be conserved for the duration of the plan period. Section 6.3.1 shows a conservative estimate of as much as 1,991 acres of additional murrelet habitat could be added to the Plan Area during the plan period. This increased acreage most likely also will lead to a net increase in the number of murrelets nesting in the Plan Area, thus mitigate any potential take that results from buffer management.

7.3.2.2 Bald Eagle

Simpson will minimize impacts to eagles by: 1) protecting all eagle nest sites when known; 2) protecting most, if not all existing perch sites along river and wetlands; 3) developing and implementing a communal roost site conservation plan in the North Fork Skokomish River drainage in conjunction with the WDFW. Additionally, Simpson will provide mitigation for bald eagle perching and nesting habitat that may be inadvertently lost by timber management activities. This mitigation will occur by establishing the RCR and the forested wetland conservation programs, which will lead to additional nesting and perching habitat development along or near rivers, streams and wetlands. These measures combined are expected to lead to a net increase in nesting and roosting habitat in the Plan Area, and most likely a net increase in bald eagles using the Plan Area, during the plan period.

7.3.2.3 Band-tailed Pigeon

The amount of take if any, that could occur to band-tailed pigeons as a result of herbicide spraying will be minimized as a result of measures in this plan (defined in Section 5.3.3). There most likely will not be a net decrease of nesting habitat over the plan period, therefore mitigation measures were not considered for nesting habitat losses. The potential for foraging habitat take resulting from herbicide spraying will be mitigated by the expected increased level of foraging habitat quantity and quality in the RCR and wetland conservation areas. These measures are expected to provide a net increase in habitat quality and quantity for this species as compared with timber management practices that would occur without this plan.

7.3.2.4 Harlequin Duck

Potential disturbances, or take, to the harlequin duck due to timber management operations will be minimized by placing operational restrictions around nest sites (as defined in Section 5.3.4). Some minor amounts of nesting habitat loss could occur to this species as a result of implementing this plan. Those potential losses will be mitigated by implementing the RCR strategy, which increases the amount of riparian and aquatic ecosystem protection on the river systems that these ducks typically inhabit. These measures are expected to provide a net increase in habitat quality and quantity for this species above that which would occur without this plan.

7.3.2.5 Roosevelt Elk

The road closure program defined in Section 5.3.5 will substantially minimize the potential take of this species resulting from temporal motor vehicle traffic disturbances. This measure alone will ensure the survival of this species in the Plan Area because habitats are also adequate for their survival. However, in the event that there is some incidental loss to individual members of the population, Simpson will provide mitigation in the form of a forage seeding program, as defined in Section 5.3.5. These measures will help ensure there will be a net increase in habitat quality for elk during the plan period, as compared with management that would occur without the HCP.

7.3.2.6 Snag Dependent Species

Simpson's HCP program will minimize potential habitat losses, resulting from timber management, by implementing the RCR program, wildlife tree conservation program, and the wetlands conservation program. Additionally, Simpson will mitigate potential habitat losses caused by timber management by developing additional and larger snag habitat in the RCR and wetlands, and by conserving, for 50 years, an average of approximately 25 trees per acre of the 261,000 acre plan area. These minimization and mitigation measures will help ensure these species habitats are maintained and enhanced in the plan area so that these species populations can survive and recover.

Table 19. Summary of potential habitat impacts, species take, and the net result of implementing the Simpson HCP for covered wildlife species.

Species	Potential Habitat Impacts	Potential Species Impacts	Net Impact with Implementation of Conservation Measures on Species
Marbled Murrelet	No loss of occupied habitat, potential disturbance of buffer in a low percentage of cases.	No loss of adults or young. Disturbance of some buffers could result in a slight increase predation or loss of chicks or eggs.	Net increase in nesting habitat availability and quality through the plan period. Population levels are expected to also increase through time.
Bald Eagle	No loss of nesting sites expected, or loss of communal roost site. Some potential loss (a few trees each year) of perch sites possible.	No loss of adults, young, chicks, or eggs.	Net increase in habitat quality and availability. Population levels are expected to increase as a result of this plan.
Harlequin duck	No direct impacts are expected to habitats, although some small scale indirect impacts may occur (e.g. reduced forest buffer of nest sites)	Very slight possibility of impact to eggs, chicks, or nests, however this potential will be substantially decreased with conservation measures.	A net increase in nesting, foraging and brood rearing habitat quality, and a net increase in nesting habitat. Population levels should not decline and potentially will increase.
Band-tailed pigeon	Limited area impact on forage producing shrubs by herbicide spraying. Nesting habitat availability will remain relatively consistent during HCP period.	No loss of adults or fledged young. Some loss of nests, eggs and chicks will occur due to timber harvesting of nesting habitat.	A net increase in forage habitat protection will occur. No net decrease in nesting habitat. Potential for a net increase in population levels due to increased forage habitat protection.
Roosevelt elk	Changing habitat availability resulting from harvest rotations, however quantity and quality will remain relatively consistent. Road closures will increase availability of habitat.	Elk populations in areas without road closures may be detrimentally impacted by increased elk hunting pressure (as a result of road closures elsewhere in the Plan Area). These potential impacts; however, most likely would not offset the expected increase in elk population in the Plan Area nor threaten their continued viability in the Plan Area.	Moderate increase expected in habitat quantity and quality as a result of road closure program and forage seeding. Potential for increased population levels due to habitat enhancements.
Cavity Dependent Bird Species	No net loss of habitat is expected due to RCR, wildlife tree conservation, and wetlands conservation, although there will be changing habitat availability resulting from harvest rotations.	No adults or fledged young injured or lost, however a few eggs and chicks could be lost each year.	Small increase expected in habitat quantity and quality, resulting from RCR, wildlife leave tree and forested wetland conservation. Potential for net increase in population levels due to habitat enhancements.

8 IMPLEMENTATION MONITORING

8.1 PURPOSE

The purpose of Implementation Monitoring is to document Simpson's adherence to conditions of the HCP. This requirement will be accomplished through an operational tracking system based on aerial photos, field data and Simpson's GIS. The information to be developed is intended to be of sufficient detail and scope to permit the Services to confirm that Simpson's management of the Plan Area comports with the requirements of this HCP. Implementation monitoring reports for each of the conservation programs will be available for agency review annually at the end of the first quarter of every calendar year. In addition, Simpson will prepare 5-year reports and will conduct periodic surveys as discussed below.

8.2 ANNUAL IMPLEMENTATION MONITORING REPORTS

Annual implementation monitoring reports will include a description of the following:

8.2.1 Riparian Conservation Reserves

- Maps:
  Plan Area with all harvest units from preceding year identified.
  Unit level maps with details of channel class, RCR layout, and management key.
- Reports:
  Acres of RCR cover type by channel class and management treatment.

8.2.2 Wildlife Reserve Trees Outside the RCR

- Maps:
  Unit-level maps with locations of wildlife reserve tree patches.
- Reports:
  Number of acres subject to supplemental wildlife reserve tree prescriptions and characterization of trees retained.

8.2.3 Wetlands

- Maps:
  Unit level maps with detail of wetland features including forested wetlands, WMZ layout, by WMZ class, and management key.
- Reports:
  Acres of WMZ by wetland class and treatment, and forested wetland acres by treatment.

8.2.4 Road Management

- Maps:
  Roads inventoried and road remediation by type.
- Reports:
  Miles of road inventoried, dollars spent and amount of miles of work completed by road remediation type, including forage seeding.

8.2.5 Unstable Slopes

- Maps:
  Miles of road and maps of roads built on slopes in excess of 60%.
- Reports:
  Number of RCR acres by mass wasting or terrain units for total annual harvest area.

8.2.6 Hydrologic Maturity

- Percentage of each basin being managed for hydrologic maturity in mature, immature and intermediate hydrologic stand conditions.

8.2.7 Experimental Management

- Character of any such projects and their current status.

8.2.8 Supplemental Prescriptions

- Detailed description of specific supplemental prescriptions and maps of implementation areas.

8.2.9 Wildlife

- Results of all wildlife surveys done during the preceding year.
- Annually document and report the location and size of areas that were not sprayed with herbicide as a result of prescriptions defined in Section 5.3.3.
- Annually document and report the location, size and total acreage of forest stands that were fertilized.

8.2.10 Adaptive Management

- Adaptive management acreage account ("AMAA") balance.
- Description of where and for what purposes adaptive management acres were used.

8.3 FIVE-YEAR IMPLEMENTATION REPORTS

8.3.1 Vegetation Cover Types

- Every ten years, Simpson will update the estimates of vegetation cover types and ages in the RCR (established and planned).

8.3.2 Wetland Classification and Inventory

- At five and ten years from date of ITP signing, report of inventoried wetland acres by HGM class.
- Report of reference wetland monitoring work conducted.

9 RESOURCE MONITORING PROGRAM

9.1 GENERAL

Simpson will implement a resource assessment, monitoring and research program in order to assess progress being made in the Plan Area toward achieving the established resource objectives (Section 4). Specifically, such an assessment, monitoring and research program will :

1. Validate assumptions and associations in the underlying landscape and channel classification scheme;

2. Evaluate the physical and ecological outcome of Simpson's forest management activities on aquatic and riparian systems;

3. Determine trends in specific habitat conditions and the distribution or relative abundance of particular species; and.

4. Document criteria necessary for evaluating resource objectives.

Results of this work will be communicated to the Services and the other members of the Scientific Advisory Team ("SAT"), (Section 14) and will be used in determining if future adjustments to management prescriptions are appropriate pursuant to the adaptive management procedures described in Section 10. In addition to these elements of the monitoring program, Simpson will also conduct pre-harvest reviews and audits to ensure and assess implementation compliance with the management prescriptions then in effect under this Plan. The Implementation Monitoring Program is described in the previous Section 8.

9.2 PROGRAM APPROACH

An environmental field program with the broad purposes stated above will require projects and experiments to be conducted at different levels of detail and/or rigor. As established in this program, resource assessments, monitoring activities and research projects complement each other in addressing the effectiveness of management prescriptions and validating assumptions of the conservation program. Assessment level work will "set up" or develop topics so that they may be efficiently resolved through monitoring or research activities. Simpson expects that about 30, 40, and 30 percent, of the annual resource monitoring program will be expended on assessment, monitoring and research respectively. Table 20 specifically describes the complementary nature of the HCP resource-monitoring program. Some elements of this overall program can be classified as effectiveness, trend, baseline, validation, or compliance monitoring as defined by McDonald et. al. (1991). In the following subsections, specific questions are posed to help focus the monitoring and research components of the program.

9.2.1 Assessment

Assessment level work will focus on developing information useful in formulating hypotheses for testing in the more rigorous monitoring or research components of the program. Simpson will also use assessment level work to validate assumptions made in the landscape stratification and channel classification schemes and refine elements of the TMDL such as verification of historical mass wasting rates for various channel classes (aerial photo interpretation). The methods generally employed for assessment level work will be designed to obtain information quickly and efficiently as a first priority. Assessment level work may also focus on new ideas or field problems for which no well established protocols exist or topics of general interest for which there is no need, or the nature of the problem prohibits highly accurate measurements.

Assessment level projects that Simpson currently is engaged in and will continue under the HCP include: 1) timber harvest unit operational reviews, 2) mapping channels and verifying the HCP landscape stratification and channel segment classification system, and 3) describing fish distribution using a variety of methods, (including the use of electro-fishing equipment in accordance with guidelines of the WDFW and endorsed by the Services). All information obtained through the operational timber harvest unit reviews is stored in a stream segment relational database associated with Simpson's GIS. This database has been demonstrated to the Services, is updated regularly and will be the core repository for resource information collected during subsequent monitoring and research activities. As such this database will become a powerful tool in refining Simpson's understanding of resource conditions, trends and by inference, the effectiveness of management prescriptions.

Table 20. HCP Monitoring Program components, their primary areas of focus and relationship to each other.

ASSESSMENT	MONITORING	RESEARCH
Verifies baseline assumptions about the landscape stratification and channel classification scheme. *Validation Monitoring.* Provides broad overview of habitat conditions. Develops hypotheses for more rigorous testing through other monitoring or research components. Provides consultation services to timber harvest unit layout or logging operations.	Tests specific hypotheses with quantifiable, repeatable methods (conclusions may form the basis for initiating adaptive management discussions). *Effectiveness Monitoring*. Determines trends in habitat conditions or animal distribution or relative abundance. *Trend Monitoring.* Determine compliance with resource objectives and TMDL. *Compliance Monitoring.*	Develop baseline information necessary to test specific hypotheses (e.g. small basin hydrologic characteristics). *Baseline Monitoring.* Develop detailed information on special subjects where only speculative or conflicting data currently exist (e.g. interaction of management activities and triggering of deep-seated landslides within the inner gorges).

9.2.2 Monitoring

For the effectiveness element of the monitoring program to be successful as an informational feedback loop for management, it needs to be focused and produce specific information about the consequences of individual and collective forest management activities (this also holds true for other monitoring program elements). The only way to ensure this result is to enforce discipline on the monitoring program through specific questions and objectives. This is the most important step in formulating an effective water quality or habitat monitoring program (McDonald et. al. 1991) and unless this step is taken the monitoring program will be inefficient and ultimately inept in answering management questions. Monitoring questions and objectives will be designed with regard to resource objectives or particular management prescriptions and linked to specific LTUs and channel classes or species as appropriate.

In general, monitoring program elements will be those for which relatively well established methods are available and the character of the problems under study is reasonably well known. Monitoring projects that Simpson is already engaged in and that will expand under the HCP monitoring program include: 1) amphibian distribution and relative abundance, 2) riparian forest conditions (including snag inventories), 3) in-channel habitat conditions, and 4) stream temperature. Data sets associated with monitoring will be derived using methods that are reproducible and that can be used to establish reliable baselines for determining trends. The database described above will help put these results into a spatial context for the entire Plan Area.

9.2.3 Research

Elements of the resource monitoring program that will be assigned to the research portion of the program will generally fall into two categories. 1) Those for which a particularly complex and long-term baseline is necessary for testing specific hypotheses (e.g. Simpson will implement in year one of the Plan Period a long term paired watershed study of hydrologic characteristics of small basins in the CUP). 2) Those for which detailed information on special subjects needs to be developed or where only speculative or conflicting data currently exist (e.g. interaction of management activities and triggering of deep seated landslides within inner gorges). All research projects will be focused by specific key questions.

9.3 LINKAGES BETWEEN MONITORING PROGRAM AND RESOURCE OBJECTIVES

The Resource Monitoring Program will provide information needed to determine whether or not progress is being made toward the achievement of resource objectives. In most, if not all cases, information needed to verify the attainment of resource objectives will come from multiple assessment, monitoring and research activities. In order to make good decisions regarding the resource objectives it will be necessary to look to more than one piece of evidence. For example, in determining if surface water temperatures are being maintained consistent with a naturally functioning landscape (Plan Area Aquatic Resource Objective No. 4, Section 4.4.1), it will be necessary to look to data derived through three components of the Resource Monitoring Program: temperature monitoring, riparian vegetation monitoring and in-channel habitat assessment. Table 21 provides a quick reference linking each resource objective with correlative monitoring program questions. (Reviewers are directed to Section 6, Table 13 for information on how the resource objectives link to the covered species.) With regard to aquatic habitat issues and species, understanding and accounting for the mechanisms and processes of wood, water, sediment and energy delivery to streams will be the primary focus of Simpson's Resource Monitoring Program. Measurement of in-channel habitat variables alone will be insufficient to evaluate the effectiveness of the management prescriptions. Figure 12 provides a stylized flow chart of the working relationship between resource objectives, the Resource Monitoring Program and adaptive management.

9.4 INITIAL MONITORING PROGRAM

Simpson has developed an initial Monitoring Program that is organized around the following Plan Area and LTU specific questions. Implicit in these questions are specific management issues that relate to the watershed inputs and processes necessary for healthy aquatic and riparian systems. As the monitoring program matures, questions may be modified or replaced with new ones derived in consultation and coordination with the SAT.

Each monitoring or research question will be the basis for a workplan that will have multiple objectives and test hypotheses derived from the objectives. While the questions have been initially framed, the objectives and hypotheses for the Work Plans have not. During the first year of Plan implementation Simpson will continue to conduct the program elements described above (Sections 9.2.1and 9.2.2) and by year two the Resource Monitoring Program will be fully adapted to comply with the HCP requirements.

9.4.1 Plan Area Wide Monitoring Questions

The following four questions form the basis for Plan Area wide monitoring activities that will address riparian forest conditions, in-channel habitats, road surface erosion, mass wasting and stream temperatures.

1. *How do stand characteristics of the RCRs and the status of individual trees change over time?* (Rationale: To adequately evaluate the performance of the RCR in providing necessary stream functions and to determine how these stands are responding to adjacent land management, their character and condition must be tracked in detail through time.)

2. *How do in-channel habitat conditions compare to reference conditions, (either modeled or observed) and what is the distribution of those conditions by channel class?* (Rationale: Although in-channel habitat conditions are expected to vary considerably over time in response to natural climatic events, there is considerable interest in how these conditions compare to other systems or to expected conditions.)

3. *What is the relative contribution of natural and management related mass wasting and surface erosion from roads to the sediment supply in Plan Area streams?* (Rationale: Use of sediment budgets is a powerful technique in assessing the risk of management activities and focusing remedial work associated with resource objective No. 15. Surface erosion from roads can be a significant source of fine sediment to stream channels but the coarse sediment fraction is also an important modifier of stream habitat.)

4. *How are management activities influencing surface water temperatures of Plan Area streams?* (Rationale: Broad environmental controls of different types exist on stream temperature across the Plan Area. Validation of this assertion and an appraisal of how each temperature regime responds to management activities is important to document.)

9.4.2 LTU Specific Monitoring Questions

The following fourteen questions form the basis for LTU specific aquatic monitoring activities that will address a variety of watershed and channel network processes and functions. The LTU specific monitoring activities will supplement the Plan Area wide monitoring work and contribute to the evaluation of particular management prescriptions as they function on specific landscapes.

9.4.2.1 Alpine Glacial (AGL)

5. *What is the role of roads in the interception of ground water and how does this process influence the hydrology of small basins?* (Rationale: Observations indicate shallow ground water

is easily captured via the ditch system and rerouted from its normal down slope pathway, dramatically altering the time it takes for precipitation to contribute to surface flow during winter.)

6. *Are some stream segments in the AGL-Qo6 and AGL-Qo7 channel class "disconnected" from historic floodplain surfaces? What caused this condition? What are the consequences for the present day channel and can anything be done to reverse this condition?* (Rationale: Observations indicate that some channel segments appear disconnected from apparent historic floodplain surfaces, functionally confining them between stream banks of resistant glacial till. Several possible causes for this condition exist, including aggressive stream clean out practices of the past. Regardless of the cause, full expression of habitat character in these channels is not possible without greater understanding and remedy of the situation.)

7. *What pathways of riparian forest succession developed in response to the initial timber harvest? Should anything be done to redirect those pathways, and what are the likely outcomes of this kind of ecological intervention?* (Rationale: Because topographic moisture gradients are severe in some riparian areas of the AGL, red alder has persisted after the first timber harvest and has suppressed conifer regeneration. The persistence of hardwood dominated riparian stands has implications for long term recruitment of woody debris input to streams. However, a significant amount of uncertainty exists regarding the outcome of silvicultural treatments and desired community structure in these settings. Simpson will evaluate options for accelerating conifer development in some areas where instream wood levels are particularly low.)

9.4.2.2 Crescent Islands (CIS)

8. *What pathways of riparian forest succession developed in response to the initial timber harvest? Should anything be done to redirect those pathways, and what are the likely outcomes of this kind of ecological intervention?* (Rationale: Because topographic moisture gradients are pronounced in some riparian areas of the CIS, mixed hardwood stands have persisted after the first timber harvest and have suppressed conifer regeneration. The persistence of hardwood dominated riparian stands has implications for long term recruitment of woody debris input to streams. However, a significant amount of uncertainty exists regarding the outcome of silvicultural treatments and desired community structure in these settings. Simpson will evaluate options for accelerating conifer development in some areas where instream wood levels are particularly low.)

9. *What are the consequences on fish distribution and sediment delivery to larger streams from using culverts for stream crossings in CIS-Qc1 and CIS-Qc2 channel segments?* (Rationale: Highly erodible channel bed and banks of unconsolidated sands and small gravels make it difficult to maintain passage through culverts in these channel segments over the long term. For permanent stream crossings, solutions need to be developed that avoid fish passage problems and the erosion of channel beds.)

10. *Is there an influence of forest land management on the depth of stream bed scour and bank erosion in pool riffle channels of the CIS?* (Rationale: These stream segments tend to be naturally sediment rich with easily mobilized channel beds and the natural distribution of channel bed scour depths could be susceptible to changes in sediment supply or discharge. These changes could affect the reproductive success of anadromous fish species.)

9.4.2.3 Crescent Uplands (CUP)

11. *What are the respective roles of sediment storage and sediment supply (in CUP/C1-4 channels) on the character of channel segments at the boundary zone between the ROP and the CUP (ROP-C7 segments)?* (Rationale: Both sediment supply and the character and spacing of the debris dams and other storage features in the steep channel network of the CUP can affect the routing of coarse sediment to alluvial fan channel segments downstream. Sediment dynamics in the CUP canyon channel segments and their contributing landscapes need to be related to channel conditions in downstream segments that support anadromous fish.)

12. *How does the rate and pattern of timber harvest and road density affect small basin hydrology?* (Rationale: Changes in the hydrologic cycle associated with snow melt runoff could adversely affect the character of stream breeding amphibian and resident fish habitat and transmit effects to downstream segments that support anadromous fish.)

9.4.2.4 Recessional Outwash Plain (ROP)

13. *Are some stream segments in the ROP-Qc3 channel class "disconnected" from historic floodplain surfaces? What caused this condition? What are the consequences for the present day channel and can anything be done to reverse this condition?* (Rationale: Observations indicate that some channel segments appear disconnected from apparently historic floodplain surfaces functionally confining them between stream banks. Several possible causes for this condition exist, including aggressive stream clean out practices of the past. Regardless of the cause, full expression of habitat character in these channels is not possible without greater understanding and remedy of the situation.)

14. *How are forest management activities affecting surface water temperatures at the segment and the sub-basin level in streams of the ROP?* (Rationale: Data suggest small streams in the ROP may be especially susceptible to increases in temperature due to a loss of shade from riparian canopy. Wetlands and beaver ponds exert unknown influences that may alter surface water temperatures through multiple processes.)

15. *Are forest management activities adversely affecting the functional integrity of wetlands?* (Rationale: Many high quality wetlands exist in the ROP and more information is needed on how forest management may affect wetland character and function over the long term.)

9.4.2.5 Sedimentary Inner Gorges (SIG)

16. *What is the extent and distribution of bedrock channel segments and what are the causal links to forest management activities?* (Rationale: There is a loss of alluvial cover (gravel substrate) in some channels of the SIG that may affect their long term productivity for anadromous and resident fishes.)

17. *What is the contribution and fate of sediment derived from side slope failures along small streams in the SIG and are they triggered by management activities?* (Rationale: Observations indicate that there are a large number of relatively small failures on the side slopes of small streams in the SIG. It is important to understand the role, if any, that forest management activities may play in triggering these events.)

18. *What are the local and systemic effects of sediments derived from inner gorge failures (shallow rapid, deep seated, and chronic erosion of inner gorge side slopes) within the overall sediment budget of the SIG and do forest management activities trigger these failures?*

(Rationale: Qualitative observations indicate there is a marked delivery of sediment from inner gorge surfaces that may overwhelm contributions from other sources. This sediment may have severe impact on the suitability of habitat for large salmonids and other species. It is important to understand the role, if any, that forest management activities may play in triggering events that supply these sediments.)

9.4.3 Wildlife Monitoring Questions (Plan Area)

19. *How will bull trout be distributed in the Plan Area at year 10, 20, 30, and 40 relative to a baseline established by year 5 of the Plan?* The initial surveys, which will be done according to USFWS endorsed protocols, will establish the basis for subsequent monitoring efforts, the goal of which is to track how well bull trout are maintained across the landscape under HCP management. If subsequent monitoring documents a reduction in the range of bull trout, adaptive management discussions will be initiated. (Rationale: Bull trout distribution is currently not well described for the Plan Area and must be established in order to monitor the response of this species to HCP management.)

20. *Will the relative abundance and distribution of stream breeding amphibians change under HCP management?* If there is a decline in relative abundance or distribution adaptive management discussions will be initiated. Data will be compiled and analyzed on an ongoing basis. (Rationale: Management of headwater streams for the maintenance of stream breeding amphibian populations is unproven and must be monitored to demonstrate the response of these animals to HCP management.)

21. *Will the relative abundance and distribution of riverine breeding western toads change under HCP management?* If there is a decline in relative abundance or distribution adaptive management discussions will be initiated. (Rationale: Western toads have declined throughout much of their range in western North America and no continuous long term monitoring data exists. The Plan Area supports populations of riverine breeding western toads for which 4 years of data already exist. The trend of these populations needs to be tracked through time to evaluate this species response to HCP management.)

22. *Will snags (greater than 20 feet in height) provided by the RCR, wetland, unstable slopes, and supplemental wildlife tree management prescriptions meet or exceed 2 snags/acre 12- 24" DBH and 2 snags/acre > 24" DBH averaged by total RCR acreage in each LTU, at years 20 and 40 of the Plan?* Baseline data will be collected in accordance the schedule in Table 22 and if it does not meet the above referenced targets, adaptive management discussions will be initiated. (Rationale: Maintenance of habitat for covered snag dependent bird species depends on the density of snags of particular size and character.)

23. *Are amphibians adversely affected by operational application of nitrogenous fertilizers?* Simpson will continue its ongoing research in this area and expand it to include water sampling and surveys for larval abnormalities of pond breeding amphibians. If significant adverse effects are indicated by the data, adaptive management discussions will be initiated pursuant to Section 10. (Rationale: Recent studies have documented potential linkages between elevated nitrates in surface water and larval abnormalities in some species of amphibians.)

9.5 ONGOING RESOURCE MONITORING PROGRAM

On an annual basis, Simpson will propose to the Scientific Advisory Team ("SAT"), (described in Section 14 below) and the Services an annual monitoring program (with related work plans). Simpson's proposal will generally follow the approach outlined above and, initially, will be designed to respond to some or all of the key questions identified below (Table 21). The Services and Simpson will confer in good faith regarding any changes which the Services may request be made to the Simpson's proposed monitoring work plans. Input from the SAT will also be sought. If Simpson and the Services are unable to agree to a proposed annual monitoring program, Simpson will implement the program as required by the Services subject to the limitations set forth in Section 9.6 below.

9.6 LIMITATIONS ON RESOURCE MONITORING PROGRAM

Notwithstanding anything in this Section 9 to the contrary, in no event will Simpson be required to expend more than the annual monitoring cap (plus any available carry-over amount from the two immediately preceding plan years) to design, discuss and implement an effectiveness monitoring program (including the assessment, monitoring and research components of such a program). The annual monitoring cap will be an amount expressed in constant 1999 dollars, (i.e. the amount will annually be adjusted for inflation) equal to the sum of $275,000 plus $.50 for each acre added to the Plan Area after the date on which the ITP is first issued. If in any year, the amount of the annual monitoring cap exceeds the amount expended and charged against such cap, the excess amount may be carried forward for up to two years. All amounts expended for monitoring will be charged to carry-over amounts (starting with the earliest year and continuing forward) before being charged against the annual monitoring cap for the year in which such amounts are expended. Expenses to be charged against the monitoring cap include wages, benefits and allocated overhead for Simpson employees performing monitoring work (pro rated based on time if such employees work less than full time on such endeavors) and all out of pocket expenses incurred in connection with such monitoring work, including without limitation, the costs of consultants, experts and independent contractors. "Opportunity costs" (e.g. forgone revenues associated with trees retained to create specific treatment effects for evaluation in a monitoring program) will not be charged against the cap nor will any costs incurred in connection with Implementation Monitoring (described in preceding Section 8).

The resource monitoring program associated with this HCP and described in Section 9 is ambitious and over the life of the HCP will cost Simpson Timber Co. a substantial amount. However, the importance of the work in evaluating the effectiveness of various mitigation and minimization measures is high. Knowing this, a careful initial assessment of the limits on spending for these purposes has been made.

Simpson has examined the tasks and the schedule for the resource monitoring program as explained in Table 21 and compared the costs of the anticipated work to the costs associated with previous monitoring and research work done since 1994. In these years some similar studies as those required by the HCP resource monitoring program have been completed, giving Simpson a good internal benchmark against which to compare future costs. Based on this experience, Simpson believes that the limits on the resource monitoring program costs are reasonable given that the work scheduled for any particular year will vary and that in any one year not all the tasks will require attention. In some years Simpson will likely spend less than the limit set and in others they will spend more. The HCP accommodates this need for annual budgetary variance in the monitoring program by allowing unspent monies to be carried over from year to year as described above.

Figure 12. Flow chart of resource monitoring program and adaptive management.

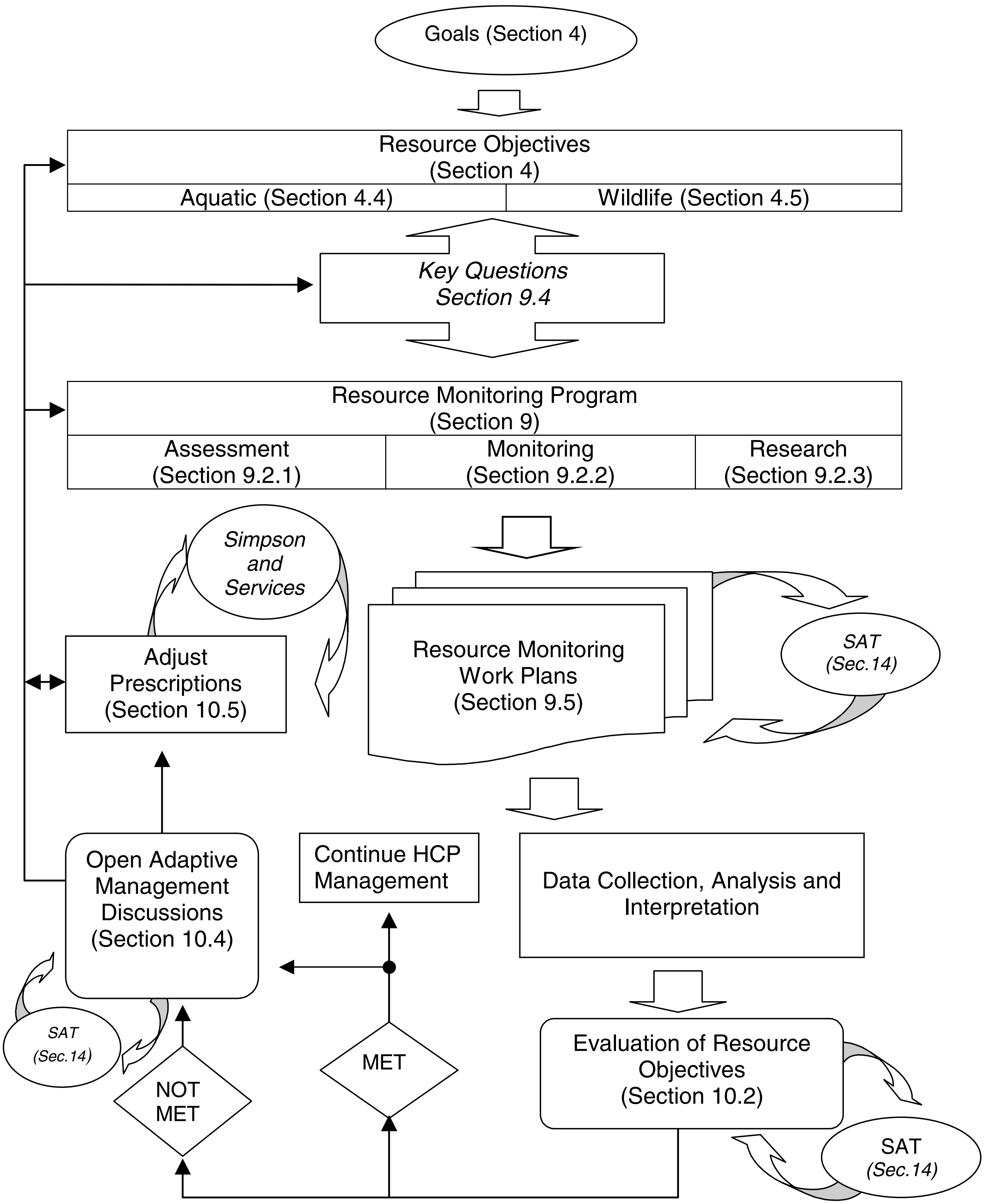

Table 21. Linkages between the Resource Objectives and the Monitoring and Research Program activities identified in Sections 9.2.1 and 9.2.2 and key questions identified in Sections 9.4.1 and 9.4.2.

Resource Objective (see Section 4)	Assessment, Monitoring, and Research Activities and Key Questions
Plan Area No. 1. Riparian forest conditions…	Monitoring element No. 2; Plan Area key question No. 1; LTU specific key questions No. 7 and 8; Wildlife key question No. 19 and 24.
Plan Area No. 2. Hydrologic processes…	Monitoring element No. 3; Plan Area key question No. 2; LTU specific key questions No. 5 and 12.
Plan Area No. 3. Mass wasting and sediment supply…	Monitoring element No. 3; Plan Area key question No. 2 and 3; LTU specific key questions No. 11, 17, and 18.
Plan Area No. 4. Stream temperature…	Monitoring element No. 3 and 4; Plan Area key question No. 1, 3 and 4; LTU specific key question No. 14 and 18.
AGL No. 1. Subsurface flow pathways…	Monitoring element No. 3; Plan Area key question No.2; LTU specific key questions No. 5.
AGL No. 2. Reconnect channels with floodplain…	Monitoring element No. 3; Plan Area key question No. 2; LTU specific key questions No. 6.
AGL No. 3. Accelerate riparian conifer development…	Monitoring element No. 2; Plan Area key question No. 1; LTU specific key question No. 7.
CIS No. 4. Accelerate riparian conifer development…	Monitoring element No. 2; Plan Area key question No. 1; LTU specific key question No. 8.
CIS No. 5. Replace culverts…	Assessment element No. 1, 2 and 3; LTU specific key question No. 9
CIS No. 6. Scour and fill…	Monitoring element No. 3; Plan Area key question No. 2; LTU specific key question No. 10.
CUP No. 7. Sediment supply, storage, transport…	Monitoring element No. 2 and 3; Plan Area key question No. 2; LTU specific key question No. 11.
CUP No. 8. Rain on snow…	Monitoring element No. 3; Plan Area key question No. 2; LTU specific key question No. 12.
ROP No. 9. Reconnect channels with floodplain…	Monitoring element No. 3; Plan Area key question No. 2; LTU specific key questions No. 13.
ROP No. 10. Elevated water temperature…	Monitoring element No. 2, 3, and 4; Plan Area key question No. 4; LTU specific key question No. 14.
ROP No. 11. Functional integrity of wetlands…	Monitoring element No. 2; Plan Area key question No. 1 and 3; LTU specific key question No. 15.
SIG No. 12. Alluvial cover over bedrock in channels…	Assessment element No. 2; Monitoring element No. 3; Plan Area key question No. 2 and 3; LTU specific key question No. 16.
SIG No. 13. Sediment supply small channels…	Monitoring element No. 3; Plan Area key question No. 2 and 3; LTU specific key question No. 17.
SIG No. 14. Inner gorge mass wasting…	Monitoring element No. 3; Plan Area key question No. 2 and 3; LTU specific key question No. 18.
Channel class specific No. 15	Monitoring element No. 3; Plan Area key question No. 2 and 3; LTU specific key questions No. 5, 11, 17, and 18.
Species specific: Bull trout distribution…	Assessment element No. 2 and 3; Monitoring element No. 3 and 4, Wildlife key question No. 19.
Species specific: Stream breeding amphibians…	Monitoring element No. 1, Wildlife key question No. 20.
Species specific: Western toad…	Monitoring element No. 1, Wildlife key question No. 21.
Species specific: Snag dependent birds…	Monitoring element No. 2; Plan Area key question No. 1; Wildlife key questions No. 19, 20, 21, and 24, Wildlife key question No. 22.
Other covered species…	Implementation monitoring (Section 8); Wildlife key question No. 23.

Table 22. Identification of monitoring program.
Work for the initial 10 years of the Habitat Monitoring Program are specified below (shading = report; X = data collection).

RESOURCE MONITORING PROGRAM	HCP PLAN YEAR[19]									
	1	2	3	4	5	6	7	8	9	10
ASSESSMENT ELEMENTS (SECTION 9.2.1)										
1. Timber unit operational review	X	X	X	X	X	X	X	X	X	X
2. Channel mapping and channel class verification	X	X	X	X	X	X	X	X	X	X
3. Fish distribution	X	X	X	X	X	X	X	X	X	X
MONITORING ELEMENTS (SECTION 9.2.2)										
1. Amphibian distribution and relative abundance	X	X	X	X	X	X	X	X	X	X
2. Riparian forest condition		X	X					X	X	
3. In-channel habitat conditions	X	X		X	X					
4. Stream Temperatures	X	X	X	X	X	X	X	X	X	X
KEY QUESTIONS (SECTIONS 9.4.1 AND 9.4.2)										
Plan area wide No. 1 Riparian condition…		X	X					X	X	
Plan area wide No. 2 In-channel conditions…		X	X	X	X		X	X	X	X
Plan area wide No. 3 Sediment supply…		X	X	X	X		X	X	X	X
Plan area wide No. 4 Water temperatures…	X	X	X	X	X	X	X	X	X	X
AGL 5. Hydrology and roads…	X	X	X	X						
AGL 6. Floodplain connectivity…			X	X						
AGL 7. Riparian forest succession…		X	X					X	X	
CIS 8. Riparian forest succession…		X	X					X	X	
CIS 9. Culverts and fish distribution…	X	X	X	X	X	X	X	X	X	X
CIS 10. Depth and pattern of scour…			X	X	X	X	X	X	X	X
CUP 11. Sediment storage and supply…	X	X	X	X	X					
CUP 12. Rain on snow…	X	X	X	X	X	X	X	X	X	X
ROP 13. Floodplain connectivity…		X	X							
ROP 14. Water temperatures in ROP…	X	X	X	X	X	X	X	X	X	X
ROP 15. Functional integrity of wetlands…		X	X	X	X	X	X	X	X	X
SIG 16. Alluvial cover in bedrock channels…		X								X
SIG 17. Side slope instability in small channels…	X	X		X	X	X	X	X	X	X
SIG 18. Inner gorge instability in large channels	X	X		X	X	X	X	X	X	X
Wildlife 19. Bull trout distribution…	X	X	X	X	X				X	X
Wildlife 20. Stream breeding amphibians…	X	X	X	X	X	X	X	X	X	X
Wildlife 21. Western toads…	X	X	X	X	X	X	X	X	X	X
Wildlife 22. Snag dependent birds…				X					X	
Wildlife 23. Effects of forest fertilization on amphibians	X	X	X	X	X					

[19] The monitoring and research program will run continuously for the plan period, only the first 10 years of the program are shown here. The program will receive comprehensive review and may be adjusted at the end of Year Ten. Each year the program will be reviewed by the SAT (Section 14).

10 ADAPTIVE MANAGEMENT

10.1 GENERAL

Simpson expects the understanding of watershed processes, natural disturbance rates and patterns, riparian forest functions, and the effects of its management practices on aquatic and riparian systems to mature over the life of the plan. As a consequence of this new knowledge, Simpson may learn how to better or more efficiently mitigate the effects of forest management activities on covered species and aquatic resources. For example, it may be demonstrated through the research and monitoring program that optimal fish production occurs with buffers that are designed to allow some light penetration instead of complete shade and that this same treatment creates a structurally diverse riparian canopy that is beneficial for wildlife. If this were to be the case, this information could be used to redesign riparian leave areas where appropriate.

10.2 RELATION OF MONITORING AND RESEARCH TO ADAPTIVE MANAGEMENT

Each of the questions identified in Section 9 (or to be developed in accordance with Section 9 thereafter) may be reduced to a suite of testable hypotheses. These hypotheses will constitute the principal suppositions about the form and function of watershed and riparian processes that are most likely to be affected by forest management activities and that relate directly to the attainment of resource objectives addressed by this Plan. As described in Section 9, the testing of these hypotheses constitutes a major portion of Simpson's Resource Monitoring Program and the results will be the direct link to adaptive management.

10.3 SUBJECTS AND SCHEDULE FOR ADJUSTMENT TO PRESCRIPTIONS

Management prescriptions will be subject to adaptive management only in accordance with this Section 10. Since physical and biological responses to different management activities are temporally variable, it makes sense to maintain flexible schedules for opening adaptive management discussions for different subjects. Requests by Simpson or the Services to adjust any of the prescriptions will only be considered following the completion of the related monitoring and research work in accordance with Section 10.4..

10.4 THRESHOLD TRIGGERS FOR OPENING ADAPTIVE MANAGEMENT DISCUSSIONS

The threshold for initiating adaptive management discussions will be tied to either the rejection or the acceptance (failure to reject), of one or more testable hypotheses associated with a particular resource objective. For example, if a hypothesis were established to the effect that a particular set of management prescriptions currently required in this HCP was sufficient to achieve a particular resource objective (Section 4), and if monitoring or research demonstrated that the hypothesis should be rejected, a discussion of the changes that might be made in these management prescriptions could be initiated by either Simpson or the Services. Conversely, if a hypothesis were established to the effect that a less restrictive set of prescriptions than are currently required for in this HCP would nonetheless be sufficient to achieve a particular resource objective, and if monitoring or research demonstrated that the hypothesis could not be rejected, a discussion of possible ways to loosen the existing restrictions could be initiated by either Simpson or the

Services. Upon the initiation of any adaptive management discussions, the scientific advisory team (Section 14) will be contacted and provided with the proposed revisions to prescriptions and the information which may bear on such modification. Simpson and the Services will consider the input of the scientific advisory team in good faith when deciding whether or not to implement any adaptive management changes.

Where the monitoring program establishes that the resource objectives (Section 4) are not being achieved, (or conversely, that the existing prescriptions could be relaxed and still achieve the desired outcomes) discussion will be initiated with the Services to address possible cause and effect relationships that could be responsible for the monitoring observations. This step is necessary because the attainment of any of the resource objectives depends not only on a suite of complementary management prescriptions, but also on the interaction of the present landscape with natural events and forest practice legacy factors. It will be necessary to determine which of the prescriptions or other factors are producing the observed results before any such prescription is adjusted.

Subject to the limitations set forth in Section 10.5 of this HCP, when monitoring and research demonstrates that resource objectives are not being met and that changes in management prescriptions are necessary to achieve them, or, alternatively, when the monitoring and research program demonstrates that resource objectives could be met with relaxed prescriptions, such management prescriptions will be adjusted to the satisfaction of Simpson and the Services.

Notwithstanding any contrary provisions of this section, road-related prescriptions (including prescriptions treating remediation and new road construction) will not be modified prior to the fifteenth anniversary of date on which the ITP is first issued. By way of clarification, changes in practices consistent with the evolution of industry best management practices will not be deemed to be a modification of a road-related prescription. During the fifteenth plan year, the Services and Simpson will convene a “TMDL Summit” with the Scientific Advisory Team. At this meeting all road inventory and remediation or other resource monitoring work relevant to the evaluation of the progress toward attainment of Resource Objective 15 (Section 4.4.2.6) (including landslide inventories based on biannual aerial photo interpretation) will be reviewed. If based on the review of such materials, it is determined that the streams in the Plan Area have not yet met, or, where applicable, are not on a trajectory to meet, Resource Objective 15 (Section 4.4.2.6) within a reasonable time frame and that the non-achievement of such Objective is or will be attributable to the inadequacy of the initial road-related prescriptions, then, subject to the limitations set forth in Section 10.5 of this HCP, the road-related prescriptions may be modified through the adaptive management provisions of this Section 10 to further reduce sediment loads delivered to Plan Area streams. From time to time after the initial TMDL Summit, either the Services or Simpson may elect to hold follow up “summits” with the Scientific Advisory Team to continue to track progress toward attainment of Resource Objective 15 (Section 4.4.2.6) and the conclusions reached at such subsequent “summits” may be used to trigger adaptive management for road-related prescriptions in the same manner and to the same extent as may be pursued at the initial TMDL Summit.

10.5 LIMITS TO PRESCRIPTION ADJUSTMENTS

Adaptive management changes required pursuant to Section 10 would be limited as follows:

10.5.1 Changes to Road-related Prescriptions

Adaptive management may be used to adjust priorities and methods for effecting road management activities as specified in Section 5.2.5. In no event, however, will Simpson be required to expend more than $250,000 expressed in constant 1999 dollars (i.e. the amount will annually be adjusted for inflation) for road-related work in any one year after the fifteenth anniversary of the date on which the ITP is first issued, provided that routine maintenance of active roads and construction of new roads will be expensed out of Simpson's normal road maintenance and construction budget without charge against the $250,000 cap. In some exceptional cases, an active road may suffer a catastrophic failure. For example, an undersized culvert may plug and cause a fill to wash out. Subject to the limitations set forth in the following sentence, a repair of such a failure will constitute road-work which may be charged against the annual cap as long as the repair is done in accordance with new road construction standards. In no event, however, may more than 20% of the annual budget cap be allocated for the repair of catastrophic failure of active roads and in no event may any portion of the annual budget cap be allocated to the repair catastrophic failures of roads first constructed after the date the ITP is issued. All such exceptional cases will be reported in the annual compliance report to the Services.

10.5.2 Changes to Number of Restricted Acres

10.5.2.1 The AMAA Account

Starting at the time of issuance of the initial ITP, an Adaptive Management Acreage Account (AMAA) will be set up. Simpson will be deemed to have "deposited" an initial credit of 920 acres to the AMAA. The AMAA will then be either drawn down (an "AMAA debit") or increased (an "AMAA credit") based in each case on changes in the total acres in the Plan Area, on changes made through adaptive management in the number of acres subject to timber harvest restrictions or on changes in wildlife leave tree restrictions. Specifically, and as described in 10.5.2.3, an AMAA debit will be made to the account: (a) on a one for one basis for each additional Restricted Acre added through adaptive management; (b) on a basis of one acre for 160 stems for additional wildlife leave trees required to be left; and (c) on a basis of .0035 acres to one for each acre deleted from the Plan Area. An AMAA credit will be made to the account: (a) on a one for one basis for each Restricted Acre removed through adaptive management; (b) on a basis of one acre for each 160 stems of wildlife leave trees no longer required to be left; and (c) on a basis of .0035 acres to one for each acre added to the Plan Area. A "Restricted Acre" is any acre in the Plan Area that at the time of harvest is subject to complete or partial restrictions on harvest (e.g. acres contained within a riparian management zone and a harvest unit).[20]

A cap of 920 acres was established for the AMAA. This cap was subjected to an analysis, the details of which follow, in order to determine how appropriate it might be, given uncertainties involved in some HCP prescriptions.

[20] If the only restrictions on harvest are requirements to leave wildlife reserve trees, these acres will not constitute "Restricted Acres" and adjustments to the AMAA for changes in these requirements will be determined as provided in Section 10.5.2.4 below.

A group of channel classes was identified by Simpson and NMFS staff where there was some uncertainty about the full attainment of riparian function under highly variable environmental conditions. This identification was based on a familiarity with the channel classes in question, (including site visits and field reviews, baseline data evaluation and the technical analysis of certain riparian functions as supplied through information in Appendix G). For purposes of this analysis and for those channel classes identified, the buffer widths were increased by 50% to accommodate hypothesized future adaptive management needs. The resulting acreage was computed based on the number of miles in those channel classes and the anticipated increase in buffer width. After further review of the information and refinement of initial questions regarding the level of uncertainty, this acreage figure was adjusted to 920 acres.

For many other channel classes, the riparian buffers and riparian strategies appear to be sufficient for maintaining and developing complete riparian functions. Where the confidence is high that functional needs will be met, it may be that the plan's prescriptions could be adjusted through the monitoring and adaptive management process, to provide acres of habitat in the future. Were this to happen, a corresponding additional "deposit" would be made to the AMAA account making those acres available for adaptive management purposes. In an effort to proceed conservatively, however, the possibility of such a future deposit was not considered in analyzing the appropriate size of the AMAA cap.

Since the primary benefits to many of the terrestrial species covered in this HCP accrue from minimization and mitigation measures associated with riparian prescriptions and guidelines, the analysis of the AMAA cap is considered to account for those species as well. The adaptive management process clearly envisions providing additional wildlife leave trees should that become necessary and there is a special accounting process to accommodate such changes without undo reductions to the number of acres credited to the AMAA (see Section 10.5.2.4). In these cases, instead of debiting the AMAA by the actual number of acres that would be necessary at that specific location to account for the required number of trees, the AMAA will be debited on a prorata basis of 160 trees per acre (number of acres to debit = required trees divided by 160).

10.5.2.2 Limits on Acreage Changes in General

No adaptive management changes will be allowed that will result in AMAA debits that would cause a deficit (negative) balance in the AMAA. All AMAA credits and debits attributable to the addition or removal of Restricted Acres will be taken at time of harvest of such acreage. All AMAA credits and debits attributable to changes in the total acreage of the Plan Area will be taken at the time the acres are added or deleted. Simpson will provide the Services with an annual statement of the number of acres remaining in the AMAA and an accounting for any changes made since the preceding annual report.

10.5.2.3 Changes in Number of Restricted Acres

AMAA debits and credits will occur through any adaptive management changes in riparian management prescriptions, wetland conservation prescriptions, or wildlife tree conservation prescriptions that either add additional acres subject to harvest restrictions (debits) or reduce the number of acres subject to harvest restrictions (credits) beyond the numbers of acres restricted at the time the change is made. For example, if through adaptive management, the riparian management area for the CUP-C2 channel class was changed from 25 meters to 35 meters, Simpson's harvest of a unit with 2,000 feet of CUP-C2 channel class would result in an AMAA debit of 1.50 acres (10 meter x 2,000 feet).[21] Although the adaptive management change would tentatively apply to all CUP-C2 channel classes, the AMAA debit would only be that calculated in respect of CUP-C2 channels at the time such channels were actually included in harvest units. If at the time of harvest of another unit containing a CUP-C2 channel the AMAA account had already been exhausted, the adaptive management change (i.e. increasing the riparian management area to 35 meters) would not be applied in the new unit.

Any changes to harvest prescriptions within an existing designated managed zone of a riparian management area or other changes to operations will not cause an adjustment to the AMAA (e.g., a change to the 150 square feet basal area/40% tree removal managed zone prescription). Such changes would not increase the number of "Restricted Acres." Similarly, any partial harvest prescription applied to a previously unencumbered acre (i.e., an acre that is not a Restricted Acre since complete harvest is allowed) will be debited against the AMAA on a one to one basis and not prorated based on the extent of the harvest prescription. For example, if the basal area and partial tree removal management prescription were to be extended out an additional 30 meters from the current management zone for a harvest unit with 2,000 feet of CUP-C2 channel, the AMAA would be debited 4.50 acres (30 meters x 2,000 feet).

Acres of unstable slopes that, in accordance with this Plan, are to be identified for the first time after the date on which the ITP is initially issued (and thereby subjected to the related set of harvest prescriptions) will not be charged against the AMAA cap. For purposes of this Section 10.5, such unstable slope acres will be deemed to have been subject to the harvest prescriptions from the beginning of the Plan. Future "buffering" requirements or changes in boundary lines of such slope areas as determined through the adaptive management process, however, would be charged against the AMAA. Similarly, changes in the number of Restricted Acres that result from changes in stream or wetland classifications made to correct initial erroneous classifications will not be charged against the AMAA. For purposes of this Section 10.5, all streams and wetlands will be deemed to have been properly classified from the beginning of the Plan.

10.5.2.4 Changes in leave tree prescriptions

If the number of required wildlife leave trees is increased or decreased pursuant to adaptive management, corresponding debits or credits will be made to AMAA. For example, if adaptive management called for the leave tree prescription to increase from 8 trees/acre to 12 trees per acre in a harvest unit, the AMAA debits would be determined based upon a ratio of 175 trees/acre, e.g., 2.3 additional acres would be the required debit to the AMAA for a 100 acre harvest unit where adaptive management required 12 trees per acre instead of 8 (4 x 100/175 = 2.3).

[21] Likewise if through adaptive management, the riparian management area for the CUP-C2 channel class was changed from 25 meters to 15 meters, Simpson's harvest of a unit with 2,000 feet of CUP-C2 channel class would result in an AMAA credit of 1.50 acres (10 meter x 2,000 feet).

11 IMPLEMENTATION

Implementation of the HCP will be governed by an agreement between Simpson and the Services and funded by Simpson as part of its ongoing operations in the Plan Area. The IA defines the role and responsibilities of the parties and provides a common understanding of actions that will be taken. In the event of any direct contradiction between the terms of the IA and of this HCP, the IA shall govern.

Simpson routinely carries approximately two years of harvest units under permit from the Washington Department of Natural Resources. The riparian boundaries and cutting lines of these harvest units are marked in the field according to current Washington State forest practices rules. Simpson reserves the right to harvest all units during the first 12 months after the ITP is initially issued under existing regulations and as marked in the field. Within 12 months of the issuance of the initial ITP all harvest units will be in full compliance with the terms of this HCP. During this twelve-month phase in period, Simpson will avoid the take of any listed species due to its operations.

12 ADDITION AND DELETION OF LAND FROM THE PLAN AREA

12.1 GENERAL

The IA sets forth the specific terms and conditions for the addition and deletion of land to and from the Plan Area. Under certain circumstances, Simpson has retained the right to effect such changes to the Plan Area land base without further consent or approval by the Services. In other instances, such changes must be processed as amendments to the plan and will require the Services' consent. Under some circumstances, changes to the Plan Area will not be made without first providing an opportunity for further public comment. This Section 12 provides a general summary of Simpson's rights to make changes to the Plan Area without further consent and contains an explanation of why the exercise of such rights is consistent with the plan's resource objectives.

Simpson reserves the right to withdraw up to 39,200 acres from the Plan Area over the life of the plan (other than acres in certain defined "core areas" identified in Section 12.3 and the IA). Simpson also reserves the right to add certain lands within the boundary area in Figure 1 which are not initially included in the Plan Area. These rights are reserved as a necessary means of maintaining flexibility to leverage land acquisitions that are important to Simpson in maintaining a competitive position in supplying logs to its manufacturing facilities in the vicinity of Shelton, WA.

12.2 ADDITION OF LAND

Simpson believes that it is likely that it will want to add lands to the Plan Area over the term of the HCP. While most of the lands Simpson currently owns in the Southwest region of Washington are included in the initial Plan Area, Simpson believes that it is likely that it will acquire other lands in this region which are similar in character to the lands initially included in the Plan Area and that it may wish to include such lands in the Plan Area.

Simpson will be entitled to add such lands as long as they have been managed by Simpson under the prescriptions set forth in this plan at all times after the later of the first anniversary of the day on which the ITP is issued or the date such lands are acquired by Simpson. In order to include such lands, Simpson will be required to provide certain baseline data to the Services together with an analysis demonstrating that the net effect and level of take on Covered Species on the land proposed for addition will not be significantly different than that analyzed by the Services in approving the HCP and issuing the ITP for the initial Plan Area. Since such lands will be "similar in character" and since they will have been managed in accordance with the plan prescriptions, fish and wildlife inhabiting such lands will have enjoyed similar benefits to those enjoyed by fish and wildlife using areas included within the initial plan boundaries.

At any time during the term of the Plan, with the consent of the Services, Simpson may add other lands to the Plan Area. The procedures for addressing such additions is set forth in the IA.

12.3 DELETION OF LAND

Even though there are currently no plans to sell or trade any lands within the Plan Area, it could be important for Simpson to be able to transfer some portion of its property base at some time in the future. Simpson reserves the right to unilaterally remove up to 39,200 acres over the life of the plan. This right is limited, however, to areas outside of the "core areas." Certain portions of the Plan Area are likely to be more instrumental than others in achieving the plan's resource objectives and promoting the welfare of particular species. Simpson and the Services consider the following areas (the "core areas") to be of particular importance in this regard:

1. The seven sub-basins in the CUP identified in Table 6 and shown in Figure 7.
2. LFRs identified in Figure 8.
3. Lands within the Stillwater wetland emphasis area, Figure 13.
4. Mainstem corridors of the Wynoochee, West Fork and Middle Fork Satsop, and Canyon Rivers not included in the LFRs.[22]

Because the plan functions on a segment-by-segment basis for riparian areas, the removal of any particular segments outside the core areas should not significantly affect the efficacy of the plan over the balance of the Plan Area. Of course, any land removed from the plan would no longer enjoy the benefits of the ITP and all operations on the removed parcels would be subject to the effect of the ESA, and all other applicable federal and state statutes, rules and regulations governing forest practices.

[22] Lands adjacent to the Wynoochee River from Big Creek to the confluence of the unnamed right bank tributary in the south ½ of section 35 of T 21 N, R 8 W; lands adjacent to the West Fork Satsop River from the USFS boundary to Black Creek; lands adjacent to the Canyon River from the USFS boundary to the confluence with the West Fork Satsop River; and the Middle Fork Satsop River from the USFS boundary to the confluence of the unnamed left bank tributary in the NE 1/4 of section 26 of T 20 N, R 7 W. Adjacent in this context is defined as two site potential tree heights.

Figure 13. Stillwater wetland emphasis area

Note: this figure is available for viewing as a separate file

13 ALTERNATIVE MANAGEMENT

13.1 ALTERNATIVES CONSIDERED

Five alternative management strategies were considered for managing the Plan Area. Alternative 1, the "No Action Alternative," consists of Simpson's current forest management program. This alternative is the baseline against which the effects of all other alternatives were measured. Table 23 describes the primary management strategies of the No Action Alternative and the four "action" alternatives. These five alternatives represent the reasonable range of management strategies available to Simpson for their forestland management.

Table 23. Alternative management strategies considered for the Plan Area.

Num.	Title	Brief Description
1	No Action	This management would be the same as or similar to Simpson's current forest practices, as directed by the Washington Forest Practices Rules (WFPR) and Simpson's land management policies. Future WFPR most likely will include provisions of the Forests and Fish Report and the Forest and Fish Emergency Rules (Alternative 2). However, those potential changes could not be included in the No Action Alternative because they are not final Forest Practices Rules and therefore are subject to change.
2	State Forestry Regulations with "Forestry Module" Provisions	Management would follow current Forest Practice Rules, as amended by the Forests and Fish Emergency Rules, effective March 20, 2000. The Services would issue Incidental Take Permit (ITP) coverage to the Washington State Forest Practices Board for forest practices permits, including permits issued to Simpson for timberland management. That ITP would cover fish species and 3 amphibian species in the Plan Area. Alternatives 3 and 4 were compared to the potential baseline conditions that would occur with Alternative 1 and Alternative 2.
3	Proposed Action - Simpson Habitat Conservation Plan	Management would follow prescriptions identified in the Simpson Timber Company Draft Habitat Conservation Plan (HCP) for fish and wildlife species in the 261,000 acre Plan Area, and an ITP would be issued for those species. HCP and ITP obligations would supersede State Forest Practice Rules that pertain to habitats of species covered by the HCP and ITP.
4	Modified Northwest Forest Plan	Management would follow a modified version of the Northwest Forest Plan (NWFP) which would provide conservation at approximately the mid-way point between that of Alternatives 3 and 5. Washington Forest Practice Regulations (WFPR) would be applied where NWFP guidelines are not defined. An HCP would be implemented for the same fish and wildlife species covered by Alternative 3, and an ITP would be issued for those species.
5	Northwest Forest Plan	Management would follow the standards and guidelines identified for the Northwest Forest Plan (NWFP). Washington Forest Practice Rules would be applied where NWFP guidelines are not defined. An HCP would be implemented for the same fish and wildlife species covered by Alternative 3, and an ITP would be issued for those species.

13.2 ALTERNATIVES ANALYZED

Alternatives 1, 2, 3 and 4 were analyzed in detail. Alternative 5 management would follow standards and guidelines within the Northwest Forest Plan (NWFP) which was developed for U.S. Forest Service and Bureau of Land Management Lands in Washington and Oregon. Washington Forest Practice Rules would be applied where NWFP guidelines are not defined. An HCP would be implemented for the same fish and wildlife species covered by Alternative 3, and an ITP would be issued for those species.

Alternative 5 is not an economically viable option for Simpson to implement and still remain competitive within a highly competitive timber industry. Conservation area set-asides required under Alternative 5 would be approximately 3.5 times greater than required under Alternative 1, and about 2.5 times greater than required under Alternative 2. Approximately 50 percent of the timber resource that sustains Simpson's lumber mill in Shelton, Washington, originates from lands within the Plan Area. The large cut-backs in harvestable acreage resulting from Alternative 5 could seriously affect Simpson's ability to sustain that mill operation and other operations within a highly competitive industry.

Simpson is the largest employer within Mason County and economic losses resulting from implementing Alternative 5 would also result in substantial economic losses to Mason County, which is one of the least affluent counties in Washington State. Hundreds of employees and timber/road management contractors rely on the timber management in the Plan Area, and implementing Alternative 5 could lead to an approximate 40 percent decrease in the company and community employment, as compared with Alternatives 1 and 2.

14 CONTINUING INVOLVEMENT AND DISPUTE RESOLUTION

14.1 SCIENCE ADVISORY TEAM

A Science Advisory Team ("SAT") will provide outside peer review of the resource assessment, monitoring, and research and the adaptive management aspects of this HCP. The SAT shall provide peer review and recommendations on study design, methods and analysis and associated adaptive management. Meetings of the SAT will be convened at the request of the Services or Simpson on at least an annual basis and minutes of any meetings shall be transcribed and made a part of the continuing HCP record. This group will be solely advisory and the responsibility for making decisions in respect of this HCP will remain with the Services and Simpson.

The SAT shall be composed of one person (jointly invited and approved by Simpson and the Services) from each of the following agencies and tribes: the NMFS, USFWS, EPA, the Squaxin and Skokomish Indian Tribes, the Quinault Indian Nation, the Washington Departments of Fish and Wildlife, Ecology, and Natural Resources, and a wildlife and fisheries scientist representing Simpson. On an ad hoc basis, other scientists from academia or private industry with special expertise may be invited by Simpson or the Services to participate in a SAT meeting (e.g. a geologist or hydrologist).

14.2 DISPUTE RESOLUTION

If any dispute or disagreement should arise with respect to this plan or the meaning of its terms, Simpson and the Services agree to attempt to resolve the disagreement informally and in an expeditious manner. If consultations between the parties should fail to resolve the disagreement, Simpson and the Services will consider non-binding mediation or other alternative dispute resolution processes. As provided in the IA, however, Simpson and the Services reserve the right, at any time without completing informal dispute resolution procedures, to use whatever enforcement powers and remedies are available by law or regulation, including but not limited to, in the case of the Services, suspension or revocation of the ITP.

15 GLOSSARY

Abbreviations and acronyms

AGL	Alpine Glacial lithotopo unit
BMP	Best Management Practices
CIS	Crescent Islands lithotopo unit
CUP	Crescent Uplands lithotopo unit
DOE	Department of Ecology
DBH	Diameter breast height
DNR	Department of Natural Resources (Washington State)
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily significant unit
FC	Federal Candidate (species)
FE	Federal Endangered (species)
FSC	Federal Species of Concern
GIS	Geographic information system
HCP	Habitat Conservation Plan
HPA	Hydraulic Project Approval (permit)
IA	Implementation Agreement
ITP	Incidental Take Permit
LFR	Late-seral forest reserve
LLP	Landowner Landscape Plan
LTU	Lithotopo unit
LWD	Large Woody Debris
NMFS	National Marine Fisheries Service
NWI	National Wetlands Inventory
RCR	Riparian Conservation Reserve
ROP	Recessional Outwash Plain lithotopo unit
ROS	Rain on snow
SAT	Science Advisory Team
SC	State Candidate (species)
SE	State Endangered (species)
SG	State Game (species)
SIG	Sedimentary Inner Gorge lithotopo unit
SM	State Monitor (species)
SS	State Sensitive (species)
ST	State Threatened (species)
USFS	United States Forest Service
USFWS	United States fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife

Definitions

Anadromous fish: Fish whose life history involves adult breeding in freshwater followed by variable residence in freshwater by the juveniles and migration to the marine environment and maturation prior to their return to freshwater to breed.

Aquatic dependent species: An animal species that requires some form of habitat that is supplied by water to complete its life history.

Basal area: The summed cross sectional area of tree boles in a stand expressed per unit area (e.g. square feet per acre).

Best Management Practice (BMP): Term used for management practices or prescriptions designed to protect the environment.

Break in slope (BIS): In Simpson's HCP; an identifiable position on valley walls of streams that is characterized by a slope deflection which essentially separates the valley wall from more general upland terrain. This break is often greater than 40% and is typically characterized by subtle changes in understory vegetation toward a drier community in the upslope direction. The toe of such valley slopes abut the CMZ or CDZ as described below.

Bog: A wetland type characterized by relatively deep organic soils and specialized plant species.

Channel: A watercourse defined by the presence of observable bed and banks.

Channel disturbance zone (CDZ): In Simpson's HCP; the zone adjacent to small streams that has a close linkage to several riparian forest functions. In most cases it essentially constitutes the valley floor. In many of the small stream classes, this zone may be occupied or traversed by the stream when it is dammed by beaver, diverted by a large log or a small side slope failure, or it may be the runout zone for debris flows. In most cases this zone may be identified based on vegetation (i.e. the line between the wet and more xeric plant communities). However, CDZ also typically has inclusions of slightly higher ground that support the more xeric plant communities.

Channel migration zone (CMZ): In Simpson's HCP; the floodplain and lower terraces of streams and rivers that may be occupied by the channel at some future time. This extends to the 100 year flood plain and in cases of highly erodible soils may extend beyond to include low terraces.

Cowardin vegetation class: A type of wetland plant community used for classifying wetlands in a system developed by Lewis M. Cowardin and others. The Cowardin system of classifying wetlands has been widely used in the United States since 1979 for a variety of purposes.

Delivery: Transfer of sediment from hillslope to stream channels. Sediment deposited in active stream channels is said to be delivered; sediment deposited on a floodplain, for example, is considered non-delivering.

Diameter breast height (DBH): The diameter of a tree about 4.5 feet above the ground on the uphill side.

Equipment exclusion zone: Zone adjacent to a stream or wetland where the operation of any wheeled or tracked equipment is prohibited.

Fish bearing: Used to refer to streams that support fish of any kind.

Fluvial process: Processes controlled and initiated by flowing water; e.g. sediment transport in rivers.

Habitat Conservation Plan (HCP): This plan.

Hollow: The concave area above the point of channel initiation in a valley where colluvial material (soil and unconsolidated rock) accumulates and infrequently evacuates forming landslides and debris flows (on the order of thousands of years under natural conditions).

HGM approach: Of or relating to the surface or sub-surface flow characteristics and physical landform and which are commonly controlled by surficial geology and geological history.

Implementation Agreement (IA): A contractual agreement between Simpson and the Services that controls the implementation of the HCP.

Incidental take: Take that has occurred incidental to an otherwise lawful activity".

Incidental take permit (ITP): Permit issued to Simpson pursuant to the ESA that allows for take of a covered species.

Intermittent stream: A stream whose surface flow does not persist continually throughout the entire calendar year.

Large Woody Debris (LWD): Woody debris that is the structural component of stream habitat; typically 10 cm diameter and 2 meters in length, minimum size.

Late-seral forest reserve (LFR): In Simpson's HCP; a tract of land within the riparian conservation reserve that is a relatively large contiguous area and either has older age forest characteristics or will have in the future.

Legacy roads: Forest roads constructed prior to 1974 and not currently used for forest management activities; also referred to as "orphaned" roads.

Lithotopo unit (LTU): In a scheme of regional geologic stratification, a local landscape associated with similar bedrock lithology and topography. These similarities control physical processes that strongly influence habitat characteristics at finer scales.

Perennial stream: A stream whose surface flow persists throughout the calendar year.

Resident fish: Species of fish that live their entire lives in freshwater, usually in a single water body and in many cases, in reaches that are isolated above waterfalls that exclude anadromous fish.

Riparian conservation reserve (RCR): In Simpson's HCP; lands associated with streams or wetlands that have been set aside for management other than clear cut harvesting.

Seral: Of or relating to plant community age or successional character.

Take: To "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct".

Unstable slope: A hill slope having such physical characteristics that may cause it to “fail” structurally and initiate a landslide.

Windthrow: Trees felled or blown over by wind; differs from “wind snap” in that the root wad is upended in windthrown trees as opposed to the breakage of the tree bole. Also commonly referred to as “blowdown”.

Wind snap: Trees broken by wind; frequently the crown of the tree is snapped off leaving only a few live branches.

16 LITERATURE CITED

Agee, J.K. 1991. Fire history of Douglas-fir forests in the Pacific Northwest. Pages 25-33 in *Wildlife and Vegetation of Unmanaged Douglas-fir Forests*, United States Department of Agriculture, Forest Service, General Technical Report PNW-GTR-285.

Agee, J.K. and R.L. Edmonds, 1992. Appendix E, Forest Protection Guidelines for the Northern Spotted Owl. Pages 419-480 in *Recovery Plan for the Northern Spotted Owl – Draft*, United States Department of Interior.

Altman, B. 1998. Olive-sided flycatcher nest success in the Cascade Mountains of Northwestern Oregon: Results of a pilot study. USFWS, Portland, OR. 25 pp.

Anthony, R. G., and R. B. Isaacs. 1989. Characteristics of bald eagle nest sites in Oregon. J. Wildl. Manage, 53(1):148-159.

Anthony, R. G., R. L. Knight, G. T. Allen, B. R. McClelland, and J. I. Hodges. 1982. Habitat use by nesting and roosting bald eagles in the Pacific Northwest. Trans. N. Am. Wildl. Nat. Res. Conf. 47:332-342.

Aubry, K. A. and C. M. Raley. 1995. Ecology of Pileated woodpeckers in managed landscapes on the Olympic Peninsula. Pages 61-64 *In* Wildlife Ecology Team 1995 Annual Report. Ecology, management and conservation of sensitive wildlife species. U. S. Forest Service Pacific Northwest Research Station, Olympia, Washington, USA.

Aubry, K.A. and C.M. Raley. Unpublished data.

Barbour, R.W. and W. H. Davis. 1969. Bats of America. The University Press of Kentucky, Lexington, KY. 286 pp.

Bauer, S. and S.C. Ralph. 1999. Development of aquatic habitat indicators within the Clean Water Act. Report prepared by Idaho Water Resources Institute, U. Idaho and EPA Region 10, Seattle.

Beaver, D.L. 1972. Avian species diversity and habitat use in forests of the Sierra Nevada, California. PhD Thesis. Univ. California. Berkeley, CA. 206 pp.

Bednarz, J. C., D. M. Juliano, M. J. Huss , A. A. Beall and D. E. Varland. 1998. Interactions between fungi and cavity nesters: applications to managing wildlife and forests in western Washington: 1977 Annual report.

Bellrose, F. C. and G. R. Hepp. 1995. Wood duck (*Aix sponsa*). *In* A. Poole and F. Gill, editors. The Birds of North America, Number 169. The Academy of Natural Sciences, Philadelphia, Pennsylvania, USA, and The American Ornithologists' Union, Washington, D.C., USA.

Bellrose, F.C. 1976. *Ducks, geese and swans of North America.* Stackpole Books, Harrisburg, PA. 544 pp.

Bellrose, F.C. and D. J. Holm. 1991 Ecology and Management of the Wood Duck. Stockpole Books, Mechanics, PA. 588 pp.

Benda, L. 1990. The influence of debris flows on channels and valley floors in the Oregon Coast Range, USA. Earth Surface Processes and Landforms. 15:457-466.

Bent, A. C. 1940. Life histories of North American cuckoos, goatsuckers, hummingbirds and their allies. U.S. National Museum Bulletin 176.

Bevis, K.R. 1994. Primary cavity excavator birds in managed and unmanaged grand-fir forest habitats of central Washington's east Cascades. Masters Thesis, Central Washington University, Yakima, WA. 141 pp.

Blaustein A.R., P.D. Hoffman, D.G. Hokit, J.M. Kiesecker, S.C. Walls, and J.B. Hays. 1994. UV repair and resistance to solar UV-B in amphibians' eggs: a link to populations declines? Proceedings of the National Academy of Sciences of the United States of America 91:1791-1795.

Bosakowski, T. 1997. Breeding bird abundance and habitat relationships on private industrial forest in the western Washington Cascades. Northwest Science 71(3):244-253.

Brown, E.R. (editor). 1985. Management of wildlife and fish habitats in forests of western Oregon and Washington. Part 2 Appendices. USDA Forest Service, Pacific Northwest Region. Portland, OR R6-F&WL-192-1985.

Bull, B.L. 1991. "Ecology of the Vaux's swift." *Amer Birds* 31:11-15.

Bull, E. L. 1987. Ecology of the pileated woodpecker in northeastern Oregon. Journal of Wildlife Management 51(2):472-481.

Bull, E. L. and H. D. Cooper. 1991. Vaux's Swift nests in hollow trees. Western Birds 22:85-91.

Bull, E. L., and R. S. Holthausen. 1993. Habitat use and management of pileated woodpeckers in northeastern Oregon, USA. Journal of Wildlife Management 57(2): 335-345.

Bull, E. L., R. S. Holthausen, and M. G. Henjum. 1992. Roost trees used by pileated woodpeckers in northeastern Oregon. Journal of Wildlife Management 56(4):786-793.

Bull, E.L. 1980. Resource partitioning among woodpeckers in northeastern Oregon. PhD DissertacionDissertation. University of Idaho. Moscow, ID. 109 pp.

Bull, E.L. 1991. "Summer roosts and roosting behavior of Vaux's swifts in old-growth forests." *Northwest Science* 72:78-82.

Bull, E.L., S. R. Peterson, and J. W. Thomas. 1986. Resource partitioning among woodpeckers in northeastern Oregon. U.S. Forest Service Research Note PNW-444.

Bunnell, F. L. and A. C. Chan-McLeod. 1997. Terrestrial vertebrates. Chapter 5 *in* P. . K. Schoonmaker, B. von Hagen and E. C. Wolf, editors. Rain forests of home: profile of a North American bioregion. Island Press, Washington D.C., USA.

Bunnell, F. L., L. L. Kremsater, and R. W. Wells. 1997. Likely consequences of forest management on terrestrial, forest-dwelling vertebrates in Oregon. Report M-7 of the Centre for Applied Conservation Biology, Department of Forest Sciences, University of British Columbia, Vancouver, Canada.

Bunnell, F. L., R. W. Wells, and L. L. Kremsater. Unpublished data. Wildlife of coastal western hemlock forests. Used by permission. Centre for Applied Conservation Biology. University of British Columbia, Vancouver, Canada.

Campbell, R. W., K. H. Morgan, and C. Palmateer. 1988. Species notes for selected birds. Volume 2 *In* A. P. Harcombe, editor. Wildlife Habitat Handbooks for Southern Interior Ecoprovince. British Columbia Ministry of Environment and Ministry of Forests. Victoria, British Columbia, Canada.

Carey, A. B., N. M. Hardt, S. P. Horton, and B. L. Biswell. 1991. Spring bird communities in the Oregon Coast Range. Pages 123-144 *In* L. F. Ruggiero, K. B. Aubry, A. B. Carey and M. H. Huff, technical coordinators. Wildlife and vegetation of unmanaged Douglas-fir forests. U.S. Forest Service General Technical Report PNW-285.

Carey, AB, C. Elliott, J. Sessions, C. J. Chambers, C. D. Oliver, J. F. Franklin, M. G. Raphael. 1996. Washington forest landscape management project - A pragmatic, ecological approach to small-landscape management. Report no. 2. Washington Department of Natural Resources, Olympia, Washington, USA.

Carey, C. 1993. Hypothesis concerning the causes of the disappearance of boreal toads from the mountains of Colorado. Conserv. Biol. 7(2)355-362.

Cassirer, B.F. and C.R. Groves. 1990. Distribution, habitat use, and status of harlequin ducks in northern Idaho. Idaho Fish and Game.

DeGraaf, R. M., N. G. Tilgman, and S. H. Anderson. 1985. Foraging guilds of North American birds. Environmental Management 9:493-536.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. *The birder's handbook. A field guide to the natural history of North American birds.* Simon and Schuster, Inc., New York. 785 pp.

Erickson, E. G. 1974. Habitat preferences of wood duck (*Aix sponsa*) in northern Idaho. Thesis. University of Idaho, Moscow, Idaho, USA.

Franklin, J.F. and C.T. Dyrness, 1973. Natural Vegetation of Oregon and Washington. United States Department of Agriculture, Forest Service, General Technical Report PNW-8.

Gannon, W.L. 1995. Long-legged myotis — *Myotis volans*. Species outline. http://sevilleta.unm.edu/msb/mammal/long-legged_myotis.html. Sevilleta Long-Term Ecological Research Project, University of New Mexico, Albuquerque, NM. 2 pp.

Gannon, W.L. 1996. Long-eared myotis — Myotis evotis. Species outline. http://sevilleta.unm.edu/msb/mammal/long-eared_myotis.html. Sevilleta Long-Term Ecological Research Project, University of New Mexico, Albuquerque, NM. 2 pp.

Garrison, B.A. 1988. Draft habitat suitability index model (HSI) for the western screech owl (*Otus kennicotti*). U.S. Fish and Wild. Serv., Div. Ecol. Serv. Sacramento, CA. FWS/OBS-82/10.37. 12 pp.

Gutzwiller, K.J. and S.H. Anderson. 1987. Multiscale associations between cavity-nesting birds and features of Wyoming streamside woodlands. Condor 89:534-548.

Hagar J.C., W. C. McComb, and C. C. Chambers. 1995. Effects of forest practices on wildlife. Chapter 9 *In* R. L. Beschta *et al.*, editors. Cumulative effects of forest practices in Oregon: literature and synthesis. Oregon Department of Forestry, Salem, Oregon, USA.

Hagar, J. C., W. C. McComb and W. H. Emmingham. 1996. Bird communities in commercially thinned and unthinned Douglas-fir stands of western Oregon. Wildlife Society Bulletin 24(2):353-366.

Hansen, A. J., S. L. Garman, B. Marks, and D. L. Urban. 1993. Approach for managing vertebrate diversity across multiple-use landscapes. Ecological Applications.3:481-496.

Hansen, A. J., W. C. McComb, R. Vega, M. G. Raphael and M. Hunter. 1995. Bird habitat relationships in natural and managed forests in the western Cascades of Oregon. Ecological Applications 5(3):555-569.

Harestad, A. S., and D. G. Keisker. 1989. Nest tree use by primary cavity-nesting birds in south-central British Columbia. Canadian Journal of Zoology 67:1067-1073.

Henderson, J.A., et al., 1989. Forested Plant Associations of the Olympic National Forest. United States Department of Agriculture, Forest Service, Pacific Northwest Region, R6 Ecology Technical Paper 001-88.

Holling, C. S. 1978. Adaptive Environmental Assessment and Management. New York: John Wiley & Sons.

Huff, M. H., and C. M. Raley. 1991. Regional patterns of diurnal breeding bird communities in Oregon and Washington. Pages 177-205 *In* L. F. Ruggiero, K. B. Aubry, A. B. Carey and M. H. Huff, technical coordinators. Wildlife and vegetation of unmanaged Douglas-fir forests. U.S. Forest Service General Technical Report PNW-285.

Huff, M.H., J.K. Agee, and D.A. Manuwal, 1985. Postfire Succession of Avifauna in the Olympic Mountains, Washington. Pages 8-15 in Lotand, J.E. and J.K. Brown (ed.). *Fires' Effects on Wildlife Habitat – Symposium Proceedings, Missoula Montana, March 21, 1984*. United States Department of Agriculture, Forest Service, General Technical Report INT-186.

Ingles, L.G. 1965. *Mammals of the Pacific states.* Stanford University Press, Stanford, CA. 506 pp.

Johnsgard, P.A. 1990. Hawk, eagles, and falcons of North America: Biology and natural history. Smithsonian Institution Press, Washington. 403 pp.

Karieva, P. M., S. Andelman, D. Doak, B. Eldred, Groom, J. Hoekstra, L. Hood, F. James, J. Lamoreux, G. LeBuhn, C. McCulloch, J. Regetz, L. Savage, M. Ruckelshaus, D. Skelly, H. Wilbur, K. Zumudio and the NCEAS HCP working group. 1999. Using science in habitat conservation plans. National Center for Ecological Analysis and Synthesis and American Institute of Biological Sciences. 65 p.

Kessler, W. B., and T. E. Kogut. 1985. Habitat orientations of forest birds in southeastern Alaska. Northwest Science 59(1)58-65.

Knutson, K. L., and V. L. Naef. 1997. Management, recommendations for Washington's priority habitats: riparian. Washington Department of Fish and Wildlife, Olympia, Washington, USA.

Lawrence, L. D. 1966. A comparative life-history study of four species of woodpeckers. Ornithological Monograph Number 5.

Lee, K.N. 1993. Compass and Gyroscope. Island Press, Washington, D.C.

Lehmkuhl, J. F., and L. F. Ruggiero. 1991. Forest fragmentation in the Pacific Northwest and its potential effects on wildlife. Pages 35-46 *In* L. F. Ruggiero, K. B. Aubry, A. B. Carey and M. H. Huff, technical coordinators. Wildlife and vegetation of unmanaged Douglas-fir forests. U.S. Forest Service General Technical Report PNW-285.

Lily, K.E. 1983. Marine Weather of Western Washington. Starpath Publishing Co. Seattle, WA. 150 p.

Livingston, S. A., et. al. 1990. Habitat models for nesting bald eagles in Maine. J. Wildl. Manage. 54(4):645-653.

Logan, R.L., R.L. Schuster, P.T. Pringle, T.J. Walsh, S.P. Palmer. 1998. Radiocarbon ages of probable coseismic features from the Olympic Peninsula and Lake Sammamish, Washington. Washington Geology: Vol. 26, No. 2/3.

Lundquist, R. W., and D. A. Manuwal. 1990. Seasonal differences in foraging habitat of cavity-nesting birds in the southern Washington Cascades. Studies in Avian Biology 13:218-225.

MacDonald, L. H., A. W. Smart, and R. C. Wissmar. 1991. Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska. EPA 910/9-91-001. 166 p.

Madsen, S.J. 1985. Habitat use by cavity-nesting birds in the Okanogan National Forest, Washington. M.S. Thesis, Univ. of Wash., Col. of For. Res. Seattle, WA. 110 pp.

Magnusun, J.J. and committee on protection and management of Pacific Northwest anadromous salmonids, National Academy of Sciences. 1996. Upstream: salmon and society in the Pacific Northwest. National Academy Press, Washington, D.C., USA.

Manuwal, D. A., and S. Pearson. 1997. Bird populations in managed forests in western Cascade Mountains, Washington. Pages 1-61 *In* K. B. Aubrey, S. D. West, D. A. Manuwal, A. B. Stringer, J. L. Erickson, and S. Pearson, editors. Wildlife use of managed forests: landscape perspective. Volume 2. West-side studies research results. Washington Department of Natural Resources, Olympia, Washington, USA. TFW-WL4-98-002.

Marcot, B. G. 1984. Habitat relationships of birds and young-growth Douglas-fir in northwestern California. Dissertation, Oregon State University, Corvallis, Oregon, USA.

Marshall, David B., M.Chilcote, and H. Weeks. 1992. Sensitive vertebrates of Oregon. Ore. Dept. of Fish and Wildlife., Portland, Ore. 552 pp.

Maser, C., B.R. Mate, J.F. Franklin, and C.T. Dyrness. 1981. Natural history of Oregon coast mammals. General Technical Report PNW-133. USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, OR. 496 pp.

McClelland, B.R. 1977. Relationship between hole-nesting birds, forest snags, and decay in western larch-Dougalas-fir forests in the northern Rocky Mountains. PhD Dissertation. Univ. of Montana. Missoula, MT. 495 pp.

McClelland, R. B., S. S. Frissell, W. C. Fischer, and C. H. Halverson. 1979. Habitat management for hole-nesting birds in forests of western larch and Douglas-fir. Journal of Forestry 77:480-83.

McComb, W. C., and J. C. Hagar. 1992. Riparian wildlife habitat review. Unpublished report to Oregon Department of Forestry, Salem, Oregon, USA.

McCullough, D. A., and F. A. Espinosa, Jr. 1996. A monitoring strategy for application to salmon-bearing watersheds. Tech. Report 96-5. Columbia River Inter-Tribal Fish Commission., Portland, OR.

McGarigal, K., and W. C. McComb. 1995. Relationships between landscape structure and breeding birds in the Oregon Coast Range. Ecological Monographs 65(3):235-260.

Meslow, E. C. 1978. Relationship of birds to habitat structure-plant communities and successional stages. Pages 12-18 *In* R. M. DeGraaf, technical coordinator. Proceedings of workshop on nongame bird habitat management in coniferous forests of western United States. Portland, Oregon, USA.

Mongillo, P. E. and M. Hallock. 1997. Distribution and habitat of native nongame stream fishes of the Olympic Peninsula, Washington Dept. of Fish and Wildlife Report FRD 97-05, 45 p.

Montgomery, D. M. and J. M. Buffington. 1997. Channel reach morphology in mountain drainage basins. Geological Society of America Bulletin 109:596-611.

Montgomery, D. M., G. E. Grant and K. Sullivan. 1995. Watershed analysis as a framework for implementing ecosystem management. Water Res. Bull. 31:369-386.

Moore, W. S. 1995. Northern flicker (*Colaptes auratus*). *In* A. Poole and F. Gill, editors. The Birds of North America, Number 166. The Academy of Natural Sciences, Philadelphia, Pennsylvania, USA, and The American Ornithologists' Union, Washington, D.C., USA.

Morrison, M. L., M. G. Raphael, and R. C. Heald. 1983. The use of high-cut stumps by cavity-nesting birds. Pages 73-79 *In* J. W. Davis, G. A. Goodwin, and R. A. Ockenfels, technical coordinators. Snag Habitat Management: Proceedings of the Symposium. U.S. Forest Service General Technical Report-Rocky Mountain-99.

Morrison, P.H. and F.J. Swanson, 1990. Fire History and Pattern in a Cascade Range Landscape. United States Department of Agriculture, General Technical Report PNW-GTR-254.

Naiman, R. J. and R. E. Bilby. 1998. River ecology and management in the Pacific Coastal Ecoregion. Pages 1-10 *in* R. J. Naiman and R.E. Bilby editors. River Ecology and Management. Springer Verlag, New York, New York, USA.

Neitro, W. A., V. W. Binkley, S. P. Cline, W. R. Mannan, B. G. Marcot, D. Taylor, and F. F. Wagner. 1985. Snags (wildlife trees). Pages 129-169 *In* E. R. Brown, technical editor. Management of wildlife and fish habitats in forests of western Oregon and Washington. U.S. Forest Service Publication R6-F&WL-192-1985.

Nickelson, S., and P. Anderson. 1997. Wynoochee unit elk population estimate. Point No Point Treaty Council. 7 pp.

Nickelson, S., K. Sloan, and P. Anderson. 1995. Skokomish unit elk population estimate. Point No Point Treaty Council. 7 pp.

Norton, B. G. 1992. A new paradigm for environmental management. Pages 23-41 *in* R. Costanza, B. G. Norton and B. D. Haskell, editors. Ecosystem health. Island Press, Washington, D.C., USA.

Nussbaum, R. A., E. D. Brodie, and R. S Storm. 1983. Amphibians and reptiles of the Pacific Northwest. University of Idaho Press, Moscow, ID, 332 p.

O'Connell, M. A., J. G. Hallett, and S. D. West. 1993. Wildlife use of riparian habitats: literature review. Washington Department of Natural Resources, Olympia, Washington, USA. TFW-WL1-93-001.

Omernik. J. M. 1987. Ecoregions of the coterminous United States. Ann. Of the Assoc. of Am. Geog. 77:118-125.

Ormsby, P. 1997. Personal communication, 19 August 1997.

Pearson, S. F., and D. A. Manuwal. 1998. The importance of riparian habitat to birds. Pages 20-21 In Effectiveness of riparian management zones in providing habitat for wildlife. Timber Fish and Wildlife Agreement workshop held Oct. 14-15, 1998, Ellensburg, Washington, USA. Pages 20-21

Pechmann, J.H.K. and H,M Wilbur. 1994. Putting amphibian declines in perspective: natural and human impacts. Herptelogica 50:65-84.

Peter, D. and J. Henderson. 1996. Potential natural vegetation and fire history of Simpson's Wynoochee properties. Report for: Collection Agreement CC-96-05-18-032, Mt. Baker Snoqualmie National Forest.

Peter, D. and J. Henderson. 1999. Relationship of plant communities to lithotopo units and channel classes. Report for: Collection Agreement CC-98-06-18-028. Mt. Baker Snoqualmie National Forest.

Peterson, N. P., Hendry, A. and T. P. Quinn. 1992 Assessment of cumulative effects on salmonid habitat: some suggested parameters and target conditions. Washington Department of Natural Resources CMER Report, No. TFW-F3-92-001.

Pugh, E.A. and R.W. Pugh. 1957. Humid coastal redwood forest. Aububon Field Notes 11: 440--441.

Pugh, M.F. 1962. 1962 Blows. Seattle Post Intelligencer. March 10, 1963.

Ralph, C.J., G.L. Hunt, M.G. Raphael, J.F. Piatt, technical editors. 1995. Ecology and conservation of the marbled murrelet. Gen. Tech. Rep. PSW-GTR-152. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Dept. of Agric. 420 pp.

Ralph, S. C., G. C. Poole, L. L. Conquest and R. L. Naiman. 1994. Stream channel morphology and woody debris in logged and unlogged basins of western Washington. J. Can. Fish. And Aquat. Sci. 44:1603-1613.

Reeves, G.H., L.E. Benda, K.M. Burnett, P.A. Bisson, and J.R. Sedell. 1995. A disturbance-based ecosystem approach to maintaining and restoring freshwater habitats of Evolutionarily significant units of anadromous salmonids in the Pacific Northwest. American Fisheries Society Symposium 17:334-349.

Rhodes, J. J., D. A. McCullough and F. A. Espinosa, Jr., 1994. A coarse screening process for evaluation of effects of land management activities on salmon spawning and rearing habitat in ESA consultations. Columbia River Inter-Tribal Fish Commission., Portland, OR.

Ritcey, R., D. Low, A. Harestad, R. W. Campbell, and A. P. Harcombe. 1988. Species-habitat relationship models for birds. Volume 6 *In* A. P. Harcombe, technical editor. Wildlife habitat handbooks for Southern Interior Ecoprovince. Ministry of Environment and Ministry of Forests, Victoria, British Columbia, Canada.

Sadoway, K. L. 1988. Effects of intensive forest management on breeding birds of Vancouver Island: problem analysis. British Columbia Ministry of Environment and Parks and British Columbia Ministry of Forests and Lands. IWIFR-25.

Schieck J., K. Lertzman, B. Nyberg, and R. Page. 1995. Effects of patch size on birds in old-growth montane forests. Conservation Biology 9(5):1072-1084.

Schreiber, B. 1987. Diurnal use of snags on clearcuts in central coastal Oregon. Thesis, Oregon Stage University, Corvallis, Oregon, USA.

Schreiber, B., and D. S. de Calesta. 1992. The relationship between cavity-nesting birds and snags on clearcuts in western Oregon. Forest Ecology and Management 50(3/4):299-316.

Schroeder, R. L. 1983a. Habitat suitability index models: black-capped chickadee. U. S. Fish and Wildlife Service Publication FWS/OBS–82/10.37.

Schroeder, R. L. 1983b. Habitat suitability index models: downy woodpecker. U. S. Fish and Wildlife Service Biological Report 82(10.38).

Schroer, G. 1997. Personal Communication 21 August 1997.

Scott, V. E., J.A. Whelan and P.L. Svoboda. 1980. Cavity-nesting birds and forest management. *In* Workshop proceedings on the management of western forests and grasslands for nongame birds, Salt Lake City, USDA For. Serv. Gen. Tech. Rep. INT-86. Intermountain For. and Range Exp. Stn. Ogden, UT.

Sharp, B. E. 1992. Neotropical migrants of national forests in the Pacific Northwest: compilation of existing information. Prepared for U.S. Forest Service, Ecological Perspectives, Portland, Oregon, USA.

Sousa, P. J. 1983. Habitat suitability index models: Williamson's sapsucker. U.S. Fish and Wildlife Service FWS/OBS-82/10.47.

Sousa, P. J. 1987. Habitat suitability index models: hairy woodpecker. U.S. Fish and Wildlife Service Biological Report 82(10.146).

Sousa, P. J. and A. H. Farmer. 1983. Habitat suitability index models: Wood duck. U.S. Fish and Wildlife Service FWS/OBS-82/10.43.

Stevens, V. 1995. Database for wildlife diversity in British Columbia: distribution and habitat use of amphibians, reptiles, birds and mammals in biogeoclimatic zones. Research Branch., British Columbia Ministry of Forests Habitat Protection Branch, and Ministry of the Environment, Lands and Parks. Victoria, British Columbia, Canada. Working Paper number 05/1995.

Strahler, A. N. 1957. Quantitative analysis of watershed geomorphology. Transactions, American Geophysical Union 38:913-920.

Terres, J. 1991. *The Audubon Society Encyclopedia of North American Birds.* Wings Books, Avenel, New Jersey. 1109 pp.

Thomas, D.W. and S.D. West. 1988. Forest age associations of bats in southern Washington Cascades and Oregon Coast Ranges. Contribution 117, Wildlife Habitat Relationships in Western Washington and Oregon Research Project, Pacific Northwest Research Station, USDA Forest Service. Portland, OR.

Thomas, J. W., M. G. Raphael, R. G. Anthony, E. D. Forsman, A. G. Gunderson, R. S. Holthausen, B. G. Marcot, G. H. Reeves, J. R. Sedell, and D. M. Solis. 1993. Viability assessments and management considerations for species associated with late-successional and old-growth forests of Pacific Northwest. Report of the Scientific Analysis Team, U. S. Forest Service.

Thomas, J. W., technical editor. 1979. Wildlife habitats in managed forests: Blue Mountains of Oregon and Washington. U.S. Forest Service Agriculture Handbook 553. Washington D.C., USA.

Thomas, J.W., R.J. Miller, H. Black, J. Rodiek, and C. Maser. 1976. Guidelines for maintaining and enhancing wildlife habitat in forest management in the Blue Mountains of Oregon and Washington. *In*: Maintaining wildlife habitat in forest management. Forty-First North American Wildlife Conference. pgs. 452-476.

Tigner, J. 1997. Bats of the Black Hills (unpublished draft prepared for South Dakota Department of Game, Fish and Parks).

Timossi, I. C., and R. H. Barrett. 1995. Habitat suitability models for use with ARC/information: northern flicker. California Wildlife Habitat Relationships Program Technical Report 12. California Department of Fish and Game, Sacramento, California, USA.

U. S. Fish and Wildlife Service and National Marine Fisheries Service. 1996. Habitat Conservation Planning Handbook.

U.S.D.I. Fish and Wildlife Service. 1985. Guidelines for the management of the purple martin, Pacific Coast population. Portland, OR.

Udvardy, M.D. 1977. The Audubon Society Field Guide to North American Birds: Western Region. Alfred A. Knopf, New York. 852 pp.

Varland, D. 1997. Personal Communication 15 September 1997.

Vonhof, M.J. and R.M.R. Barclay. 1997. Use of tree stumps as roosts by the western long-eared bat. Journal of Wildlife Management 61(3):674-683.

Wake, D.B. 1991. Declining amphibian populations. Science 253:860.

Wallen, R.L. and C.R. Groves. 1989. Distribution, breeding biology, and nesting habitat of harlequin ducks in northern Idaho. Idaho Fish and Game.

Washington Cooperative Wildlife Research Unit. 1995. Centers of diversity for Washington's bats — WAGAP 1995 (map). http://salmo.cqs.washington.edu/~wagap/mammals/batdiv.gif

Washington Department of Ecology. 1985. Forest riparian habitat study. Phase 1 report. Unpublished report by Riparian Habitat Technical Committee to Washington Forest Practices Board. WDOE 85-3.

Washington Department of Wildlife. 1996. Priority habitats and species list. Washington Department of Fish and Wildlife, Olympia. 26 pp.

Weikel, J. M., and J. P. Hayes. 1997. Habitat use by cavity-nesting birds in young commercially thinned and unthinned forests. Coastal Oregon Productivity Enhancement Report 10(3):2-6.

Whitcomb, R. F., C. S. Robbins, J. F. Lynch, B. L. Whitcomb, M. K. Klimkiewicz, D. Bystrak. 1981. Effects of forest fragmentation on avifauna of the Eastern deciduous forest. Chapter 8 *In* R. L. Burgess and D. M. Sharpe editors. Forest island dynamics in man-dominated landscapes, 1st edition. Springer-Verlag, New York, New York, USA.

Woodsmith, R. D., J. M. Buffington. 1996. Multivariate geomorphic analysis of forest streams: implications for assessment of land use impacts on channel condition. Earth Surface Processes and Landforms, Vol. 21, 377-393.

Wydoski, R. S. and R.R Whitney. 1979. Inland Fishes of Washington. University of Washington Press, Seattle WA, 220 p.

Zeiner, D. C., W. F. Laudenslayer Jr., K. E. Mayer, and M. White. 1990. California's wildlife. Volume II. Birds. California statewide wildlife habitat relationships system. California Department of Fish and Game, Sacramento, California, USA.

17 APPENDICES

Appendix A: Species Descriptions and Surveys

Appendix B: Riparian Guidelines

Appendix C: Details of Road Inventory

Appendix D: Small Stream Assessment

Appendix E: Riparian Monitoring Studies

Appendix F: Changed Circumstances

Appendix G: Clean Water Act TMDL

Appendix H: List of Contributors and Advisors

Appendix A: Species Descriptions and Surveys

Aquatic Dependent Species

The following are brief descriptions of habitat requirements and distributions of aquatic species addressed by the Plan. Species have been grouped by "species associations" that essentially represent species occurrence at the channel reach or segment level. This grouping differs from a traditional trophic or micro-habitat guild approach but it facilitates the association of different species with dominant physical processes that typify various reaches of the channel network. The purpose of grouping the species in this manner is to more clearly tie the effects of management prescriptions and benefits to the species list (Table 13). For example, the headwater species association is subject to scouring effects of debris flows triggered by roads in steep terrain. All of these species would benefit from prescriptions that reduce the incidence of road related debris flows.

Headwater Species Association

The headwater species association has three species: Olympic torrent salamander, Cope's giant salamander, and the Tailed frog.

Olympic torrent salamander (RHOL): Typically inhabiting loose gravels in the splash zone of steep colluvial or cascade channels, the Olympic torrent salamander is found only on the Olympic Peninsula, WA in small headwater streams and streamside seeps (Nussbaum et. al. 1983).

Surveys: Systematic surveys of 72 small streams in the Plan Area have documented RHOL only in the CUP and exclusively in CUP-C1 channels. None were found in channels with less than 20 percent slope. Anecdotal observations from many other small streams suggest a similar pattern of distribution within the Plan Area. Adults have been captured up to 85 m from these channels in one pit fall trap array on a small tributary to the west branch of Save Creek. Riparian areas associated with this species are often classified as unstable due to steep terrain and streamside seeps.

Cope's giant salamander (DICO): Cope's giant salamanders are only found in the Olympic Mountains and Willapa Hills of WA and the Coast Range of northern Oregon. They are commonly distributed in moderate to steep headwater streams draining a variety of lithologies and appear to persist in a relatively wide range of micro-habitat conditions. Their distribution overlaps strongly with ASTR and resident cutthroat and to a lesser degree with RHOL.

Surveys: Systematic surveys of 72 small streams in the Plan Area suggest a distribution primarily within the CUP, SIG, and AGL. So far we have been unable to confirm their occurrence in the ROP or the CIS. In the other three LTUs they occur with regularity in small headwater streams with persistent summer flows, and occupy a wide range of habitats but are especially prevalent in channels with gradients of 10-20 percent with coarse cobble substrate and strong summer flows.

Tailed frog (ASTR): Tailed frogs are found throughout the Olympic Mountains and Cascades in WA and similar settings in the Coast Range, Blue and Cascade Mountains of Oregon and the Siskiyous and coastal mountains of northern California. Cool streams with coarse gravel and cobble substrates are their principal habitats where the tadpoles graze on diatoms as their principal food source.

Surveys: Systematic surveys of 72 small streams in the Plan Area have documented ASTR in the CUP primarily in CUP-C2 and C3 channels. However, the highest densities we have observed are in Qo1 channels of the SIG. We have also documented their occurrence in similar channel classes in the AGL (AGL-Qo1) and in a single CIS-C1 channel. This latter observation narrows the distance between the Olympic Peninsula populations and the Capitol Forest populations and may represent an isolated group of individuals. In all cases they are associated with coarse gravels and moderate gradient headwater channels.

Western redback salamander (PLVE): The Western redback salamander is one of the smallest but most widely distributed of the woodland salamanders, occurring from northern Vancouver Island to southern Oregon west of the cascades. This species inhabits a variety of micro-habitats including moist talus, decaying logs and under moss cover on the forest floor. During periods of wet weather they are surface active but during drier or colder periods individuals retreat to deep cover objects such as porous talus and decaying wood.

Surveys: This species has usually been encountered in all of the systematic surveys of small streams that Simpson has done and is seen with regularity in all LTUs. Limited upland surveys of woody debris and pitfall sampling have also nearly always documented this ubiquitous species.

Steep Tributary Species Association

The steep tributary species association is has two fish species, resident cutthroat trout and shorthead sculpin, and a single amphibian, Van Dyke's salamander.

Cutthroat trout (resident), (ONCL): Cutthroat trout are commonly distributed throughout the Pacific Northwest. The species exhibits highly variable life history patterns and inhabitant a wide range of habitat types from small steep streams to ponds and lakes. Resident populations, which are isolated from breeding with sea-run and other resident populations, exist above waterfalls throughout their range. Presumably these populations colonized these stream reaches prior to the complete development of the current blockages but few accurate records of early fish stocking by agencies exist and some introductions were done by settlers.

Surveys: Cutthroat trout are common throughout the Plan Area. However, their distribution in the Plan Area is frequently limited by waterfalls throughout the CUP, SIG, and the AGL above which, resident populations occur but are uncommon.

Shorthead sculpin (COCO): Shorthead sculpin are found in many drainages of the Puget Sound and western Oregon and east to Montana through the Columbia River system (Wydoski and Whitney 1979). Little information exists for the species for coastal drainages in Washington. They are considered to be a relatively high elevation species that inhabit cool, fast flowing moderate to small sized tributary streams and show no preference for unit level habitat types (Mongillo and Hallock 1997).

Surveys: In surveys of fish distribution in the Plan Area, the occurrences of shorthead sculpin have been rare. Our observations about their occurrence coincide well with conclusions of Mongillo and Hallock (1997). Principal occurrence is in small steep streams of the CUP.

Van Dyke's salamander (PLVA): Van Dyke's salamanders are found only in Washington and within the state their occurrence is fragmented into three primary areas, the Olympic Peninsula, the southern Cascade Mountains, and the Willapa Hills. Van Dyke's salamanders are not truly aquatic species but are more closely associated with streams and water than any of the other plethodons in the Plan Area. The northern margin of the Plan Area coincides with the southern extent of Van Dyke's distribution on the Olympic Peninsula.

The USFS has accounted for about 150 individuals and several nests in two years of headwater stream and riparian sampling on the Olympic Peninsula. In these surveys the median distance to a water source, usually the stream, is 5 meters with 80% of the occurrences being within 10 meters. Nearly all of the occurrences were down slope of a break in slope between the valley wall and the upslope terrain. Breeding habitat is under the bark of large downed logs and under large loose rock and cobble (Larry Jones pers. communication).

Channel segments in the CUP and steeper segments of the AGL are likely candidates to support Van Dyke's salamanders in the Plan Area. The combination of riparian prescriptions and the prohibition on removal of large residual logs and protection of seeps, which are generally associated with unstable slopes, are expected to provide adequate protection for this species.

Surveys: Systematic surveys of 72 small streams in the Plan Area and many additional anecdotal observations of amphibians have yielded only four observations of PLVA in the Plan Area. Three were in the CUP and the other was near the boundary with the AGL and the CUP. All four were immediately adjacent to streams in saturated but well drained riparian areas.

Flat Tributary Species Association

The flat tributary species association has eight fish species; coho and chum salmon, sea-run cutthroat trout, the riffle, reticulate and coast range sculpin, speckled dace, and brook lamprey.

Coho salmon (ONKI): Coho salmon are widely distributed in fresh and marine water environments from California to Alaska. Low gradient streams are the most productive for coho and off-channel habitats are important for over wintering of the species.

Surveys: The presence of coho has been widely documented throughout the Plan Area. Especially high quality coho habitat occurs in the Stillwater region of the East Fork Satsop and Schafer Creek in the Wynoochee River. The Satsop river system is known for its late running large bodied coho. Tributary habitat for coho is limited in the West and Middle Fork Satsop and the Canyon River systems.

Chum salmon (ONKE): Chum salmon range as far south as the mid Oregon coast and are the second most numerous species of Pacific salmon in commercial fisheries throughout western North America. Over their range they utilize a wide range of stream sizes but typically occupy low gradient gravel rich channels. Their freshwater production is limited by factors that affect the spawning environment as they immediately migrate to sea upon emergence from stream bed gravels.

Surveys: State and tribal biologists annually count spawning chum salmon in streams within the Plan Area. Records of abundance are available back to the mid 1960's in some cases. The gravel-rich low-gradient streams of the ROP and the CIS are highly desirable habitat for chum.

Cutthroat trout (sea-run), (ONCL): Sea-run cutthroat trout are widely distributed throughout the fresh and near shore marine waters of the Pacific Northwest. Their numbers have declined precipitously in some areas in recent years. They occupy a wide range of habitat types and display a diverse range of life history strategies making them one of the perhaps more locally adapted species of the salmonidae.

Surveys: Numerous observations of cutthroat occupying habitat within channel reaches also occupied by anadromous fishes have been made. No specific surveys for sea-run cutthroat trout have been conducted however. Principal areas for sea-run cutthroat are the Stillwater River and numerous other tributaries of the East Fork Satsop system.

Riffle sculpin (COGU): Riffle sculpin are common throughout coastal river systems in Washington, Oregon, and California. They are mainly found in small to moderate sized tributary streams. Microhabitats include slow riffles and pools with the larger individuals being found in the larger pools.

Surveys: COGU occur in small tributary streams in the SIG above waterfalls as the only fish species. Reasons for this distribution are not fully understood but these populations may have been isolated for many years. As such they have been included as an important species in the HCP.

Reticulate sculpin (COPE): The reticulate sculpin is widely distributed in coastal rivers and streams from southern Oregon through Puget Sound streams to the Snohomish River. This species is quite plastic in its adaptation to micro-habitat and is found inhabiting both riffles and pools in moderate to small sized streams.

Surveys: Some of the distinguishing characteristics between the riffle and the reticulate sculpin are difficult to use in the field (e.g. the presence or absence of palatine teeth) and individuals of these two species appear to have many intermediate characters (Wydoski and Whitney 1979). During Simpson's fish surveys, riffle sculpin are routinely encountered but reticulate sculpin appear to be much more uncommon. However, the difficulty in positively identifying these two species may cast some uncertainty on the situation and the reticulate may be much more common than is now appreciated. This species is considered to be an inhabitant of the small to moderate sized tributaries of modest gradient streams in the CIS, the ROP the AGL, and to a lesser degree the SIG.

Coast Range sculpin (COAL): Another one of the widely distributed coastal members of the family Cottidae, the coast range sculpin prefers swifter waters of medium to large sized streams. Often it is found in association with the prickly sculpin, which occupies the slower waters of the same stream segments.

Surveys: Simpson has not done directed surveys for this species but coincident with other work has observed them in the larger tributary streams of the SIG.

Speckled dace (RHOS): Speckled dace are found throughout the western North America to the Continental Divide. They generally inhabit slower waters than the longnose dace and are sometimes found in lakes and wetlands. Breeding occurs in the early summer when the adults broadcast adhesive eggs over gravel and cobble stream beds.

Surveys: Coincident with surveys of general fish distribution and habitat surveys, Simpson ahs documented speckled dace in numerous moderated size low gradient streams typically in the ROP and the SIG. In these habitats, this species is frequently found in association with coho salmon.

Brook lamprey (LARI): Brook lamprey occur widely in streams of western North America from California to British Columbia and in Washington as far east as the Yakima in the Columbia River drainage. This species spends its entire life in freshwater with the adults reproducing in small to mid sized streams or in back eddies and sandy locations of larger rivers. The larvae are filter feeders but the adults do not feed during their life phase.

Surveys: Simpson has not conducted systematic surveys for this species but during the conduct of other work has made numerous anecdotal observations that are helpful in describing its distribution. This species tends to most often be found in the sediment rich systems of the SIG and frequently is found upstream from substantial waterfalls and bedrock chutes and cascades in the SIG M and Qc series channels. Spawning occurs in the spring where the adults dig small pits in low gradient riffles where the dominant grain size is small pebbles.

Mainstem Species Association

The mainstem species association is composed of nine fish and a single amphibian.

Chinook salmon (ONTS): Chinook salmon are the largest of the several Pacific salmon species and have a broad range of river entry and spawning timing. Depending on racial characteristics individuals may spend a few months to a full year rearing in freshwater. Maturation age is highly variable with spawning occurring at 2-6 years of age within the same population.

Surveys: State agencies and Indian tribes routinely conduct escapement surveys for chinook salmon in the Plan Area. They are primarily a mainstem spawner in the Wynoochee and Satsop systems but are found in the lower reaches of the larger tributaries.

Steelhead trout (ONMY): Steelhead trout are common to coastal and inland river systems of the West Coast of North America. They penetrate watersheds deeply and thrive in small to moderate sized tributaries and mainstem rivers. Steelhead frequently overlap in their distribution with coho but for the most part are able to colonize steeper streams and in their first year of stream residency are less dependent on pool habitat than are coho.

Surveys: The presence of steelhead has been widely documented throughout the Plan Area. Steelhead spawn principally in the spring in the mainstem West and Middle Fork and Canyon River systems and the Wynoochee River. Major tributaries of the Wynoochee and all branches of the Satsop River support populations of steelhead.

Pink salmon (ONGO): Pink salmon are the smallest of the Pacific salmon and are unique in that they occur as even age maturing species and occur only in the odd year in Washington. They spend very little time in freshwater, migrating to sea upon emergence from the stream bed.

Surveys: It is unlikely that pink salmon were ever a major fish species in Plan Area channel segments. However, they were common in reaches downstream from Plan Area landscapes such as in the South Fork Skokomish River system.

Bull trout (SACO): Bull trout are found in colder headwater reaches of rivers and tributary streams throughout the Columbia River system. Over the last decade research has determined that coastal and some Puget Sound river systems support bull trout as well. However, discrimination of bull trout and dolly varden in field surveys remains problematic.

Surveys: No systematic surveys have been done in the Plan Area for bull trout. However, they are found in headwater reaches of the Skokomish and Satsop rivers and may at some time inhabit Plan Area streams. It is considered unlikely at this time that bull trout consistently reside in the Plan Area.

Dolly varden (SAMA): Dolly varden are an anadromous char that inhabit rivers along the coast of Washington and Puget Sound. They prefer cooler water temperatures and larger tributaries and mainstem rivers.

Surveys: No systematic surveys have been done for SAMA in the Plan Area. Incidental observations have been made in the south Fork Skokomish River system.

Torrent sculpin (CORO): The torrent sculpin is distributed from northern British Columbia south to the Nehalem River in Oregon and east into Idaho and Montana. This species occupies fast riffle habitat and is especially well adapted to life in rapidly flowing waters. They may grow to considerable size (3-4 inches) and age (6 years old). Although this species is primarily an opportunistic feeder of benthic invertebrates it will capture and eat small fish, including salmonid fry.

Surveys: Coincident with surveys of general fish distribution, Simpson has documented the presence of torrent sculpin throughout the Plan Area in larger tributary streams and main rivers, including the Stillwater, West Fork Satsop and Wynoochee Rivers.

Longnose dace (RHCA): The longnose dace is found throughout Washington and in other parts of North America as well. This species is particularly well adapted to fast flowing streams and is a benthic feeder. The juveniles spend the first few months of their life in open marginal habitat of their natal stream and with increased size move to deeper faster waters assuming a benthic existence.

Surveys: Coincident with surveys of general fish distribution and habitat surveys, Simpson has documented the presence of schools of juveniles along the margins of mainstem rivers in the Plan Area.

Pacific lamprey (LATR): Adult Pacific lamprey are widely distributed throughout marine waters where they are parasitic on fish. In freshwater the ammocoetes are filter feeders and remain buried in soft sand and silt. Adults migrate upstream in the spring and create spawning nests in stream bed gravels.

Surveys: Adult Pacific lamprey have been observed in the large mainstem rivers of the Plan Area and larvae are well distributed both in mainstem and larger tributary environments.

River lamprey (LAAY): Adult river lamprey are widely distributed throughout marine waters where they are parasitic on fish. In freshwater the ammocoetes are filter feeders and remain buried in soft sand and silt. Adults migrate upstream in the spring and create spawning nests in stream bed gravels.

Surveys: Adult river lamprey have not been observed in the large mainstem rivers of the Plan Area and their distribution is unknown at this time.

Western toad (BUBO): Western toads are widely distributed in a variety of lentic habitats throughout the American west. In some parts of their range their numbers have been on a steep decline. Typically they are an explosive spring time breeder in ponds and small lakes where their larvae feed until metamorphosis in the late summer.

Surveys: In the Plan Area concentrations of riverine breeding western toads have been observed in the Canyon, West and Middle Fork Satsop and Wynoochee Rivers. Breeding occurs from late

May until mid July. Toadlets emerge onto the gravel bars beginning in early August. Mature individuals are found in moist riparian environments on the SIG, especially adjacent to the SIG-L4 channel class where valley width and flood plain complexity are high.

Lentic Species Association

The lentic species association is composed of three species of fish and three amphibians.

Olympic mudminnow (NOHU): Olympic mudminnow are found in slow moving streams and wetlands with muck substrate, on the western and southern sides of the Olympic Peninsula, occurring north of the Chehalis River. Often they are associated with habitats that have thick aquatic vegetation. Recently NOHU have been found in the Lake Washington watershed, expanding their known range.

Surveys: No systematic surveys have been done for NOHU in the Plan Area but Simpson has identified several wetlands and sluggish stream systems that support them.

Prickly sculpin (COAS): The prickly sculpin is widely distributed along the coast of North America and occurs in the slower water habitats of medium sized streams and lake and wetlands. This species is tolerant of a wide range of salinity and may occur in coastal estuarine settings as well as freshwater.

Surveys: Coincident with surveys of general fish distribution, Simpson has documented the presence of the prickly sculpin in wetlands and slack water streams of the ROP.

Three-spine stickleback (GAAC): Three-spine stickleback are one of the most widely distributed fish of all, occurring in marine and fresh water environments in North America and Asia. In the Pacific Northwest they occupy a variety of habitat niches and possess a highly variable array of behaviors and life history traits to accommodate environmental differences.

Surveys: Simpson has not conducted any directed surveys for this species but coincidental to general fish distribution surveys has discovered then in numerous slack water streams and wetlands. Most of our observations have been in the ROP and often this species is in close association with dense vegetation. More often than not, Olympic mudminnow are also present where three-spine stickleback are found in the Plan Area.

Northwestern salamander (AMGR): The Northwestern salamander is found along the Pacific coast from northern British Columbia to northern California to just beyond the Cascade crest. Breeding occurs in ponds in the early spring with gelatinous eggs masses attached to submerged stems and vegetation. Larval development slow with metamorphose usually occurring after a full year of pond residence. Terrestrial adults inhabit moist forest and valley bottom environments.

Surveys: Stream adjacent pitfall traps operated by Simpson in the ROP and the SIG have occasionally captured this species as have systematic surveys of small streams in the SIG. Limited wetland surveys with dip nets and minnow traps have also documented their presence at wetlands in the ROP.

Long-toed salamander (AMMA): The long-toed salamander is distributed from Alaska to California and east to western Montana. This species is observed infrequently in spite of its wide distribution due to their largely subterranean existence. Eggs are attached to subsurface structural elements such as twigs or stems of submerged vegetation in ponds and wetlands. Larval development is rapid and metamorphosis is usually attained by early summer at low elevations.

Surveys: Stream adjacent pitfall traps operated by Simpson in the ROP have occasionally captured this species and limited wetland surveys with dip nets and minnow traps have also documented their presence at wetlands in the ROP.

Red-legged frog (RAAU): Red-legged frogs are a relatively large amphibian and inhabit a wide range of moist forest and valley bottom habitat from British Columbia to northern California. This species typically breed in ponds but may breed in river backwaters with no velocity. Eggs are attached to underwater structures most commonly stems of vegetation or twigs and branches of downed vegetation. In the summer they may be found considerable distances from water but with increasingly dry summer conditions, congregate at the edges of streams and wetlands.

Surveys: No directed surveys for this species have been conducted in the Plan Area but the red-legged frog has been one of the most commonly observed aquatic vertebrate species. Simpson has documented their presence in habitats as diverse and widely separated as small streams in the CUP to wetlands in the ROP.

Wildlife Species that are not Dependent on Snags

Marbled Murrelet (*Brachyramphus marmoratus*)
Marbled murrelets inhabit the Pacific Ocean, and in Washington and Oregon, they nest in mature or old-growth forests typically below 3,000 feet elevation (Marshall 1988, Paton and Ralph 1988). The nests are on tree platforms that are at least 7 inches across and have some overhanging protection (Ralph et al. 1995). Moss is typically present on the nest substrate, and the nests are typically in the highest one third of the tree. In order for stands to provide good murrelet nest habitat they need to be relatively easy to access with fast (approx. 40 mph) flights such an uneven-aged and multi-layered forest canopies. These stands also typically have vegetative hiding cover such as vertical cover over the nest and horizontal cover around the nest site which reduce predation from jays, crows and ravens. Horizontal vegetative cover also reduces the chances of wind disturbance to the nest.

Murrelets will incubate one egg during a nesting season that generally extends between May 1 and August 15 (Ralph et al. 1995). They will make daily flights to salt water to obtain forage for them and their chick, and these flights typically occur during early morning and late evening periods.

Species Surveys: Marbled murrelet habitat that was entirely or partially outside the RCR was surveyed in 1998 with ten surveys. These survey sites will be surveyed again in 1999 to complete two consecutive years of surveys of ten surveys each year, for each survey site.

Habitat Inventories: Marbled murrelet nesting habitat in the Plan Area (and other Simpson Northwest lands) was assessed in 1994. A total of 1,138 acres of habitat were found to be present during the 1994 murrelet nest habitat inventory. This habitat was in 38 separate areas, with an average stand size of 30 acres and an average age of 226 years old. These habitats were mapped using Simpson GIS and documented in Figure 5 of this HCP. The following describes the inventory process and criteria.

Step 1: The first step in this assessment process consisted of searching through the forest stand data for stands that met the following criteria.

- stand age 80 years or older
- stand size greater than 5 acres in size
- dominated by conifers (greater than 50 percent)
- any other areas identified by Simpson that may contain large conifer trees with well developed crowns

The forest inventory data used in this process included: stand age, species composition (percent), acres, and site class. A total of 618 timber management units were identified as meeting these criteria.

Step 2: Stands meeting the criteria in Step 1 were reviewed to determine the chances that they may be potential nesting habitat. Aerial photos and a magnified stereoscope were used in this process when assessing the following criteria.

- crown size - large developed crowns which had a likelihood of having suitable platforms
- canopy openings - stands with openings or gaps in the canopy providing assess to potential nest sites
- topography - stands with topographic relief provide greater opportunities for access for relatively dense stands

Each of the 618 management units was classified into one of the following three categories as a result of this assessment:

1. highly likely to contain suitable habitat (platforms)
2. possibly containing suitable habitat
3. obviously not suitable habitat

Step 3: All of the areas identified as Categories 1 and 2 (in Step 2) were then further evaluated with walk-through inspections. Some stands in isolated areas and some riparian stringers of mature forest were inspected from helicopter. A portion of the stands (approximately 20 percent) in category 3 were also ground truthed to verify that they indeed did not contain suitable habitat. The following questions were used when evaluating each of the stands during Step 3:

- Are platforms (large limbs, mistletoe brooms, defects, limb branching and whorls, defects, etc.) present that are at least 7 inches wide by 7 inches long in live conifer trees? (The presence of moss was not a requirement to be considered as a platform but was noted).
- Are these platforms are at least 50 feet above the ground?
- Are there at least 2 platforms per acre present in the stand?

Step 4: Stands with suitable platforms meeting the above criteria were further evaluated using the following qualitative factors:

- Canopy closure - Are platforms accessible to murrelets flying into the stand. Accessibility was considered restricted if the platforms were on limbs that were below a very dense canopy that murrelets could not access (generally greater than 90 percent canopy closure average for the entire stand was used). However, if a stand with high canopy closure also contained areas with small openings or gaps in the canopy, permitting marbled murrelets to enter the stand and access these platforms, then they were considered suitable habitat if they met other criteria in Step 4. In addition, topographic relief was also considered for accessibility.
- Width of the stand of trees, break of habitat, and amount of edge or interior forest present - Generally a break in the stand (forest containing trees with similar characteristics) of 300 feet or more was considered a break in habitat. In addition, some linear strips of trees containing thin stringers of residual old trees less than 300 feet wide and greater than 300 feet long were generally not considered as a stand of habitat due to the high degree of exposure (edge).
- Exposure - Platforms in open stands (typically stands with less than 40 percent canopy cover of dominant and codominant conifer trees) are more exposed to predation and weather (wind,

rain, temperature, etc.), therefore influencing whether the stand was considered as habitat. This assessment took into consideration the amount of overhead cover and cover from adjacent trees. Single large trees within a heavily dominated stand of deciduous trees (maple, alder, and cottonwood), rising 80-100 feet above these deciduous trees were not included as habitat.

Some stands met criteria in Step 3, but were not considered habitat because they did not meet the criteria in Step 4. The following are three examples of types of stands.

1. Riparian stringers of residual older-aged conifers with potential platforms were present along some of the major rivers in the Plan Area. These thin strips of forest were generally only 50-200 feet wide. For example, several portions of the Wynoochee River contain thin stringers of large residual conifers along the stream channel. These linear strips contain individual or small groups of 2 to 3 conifers, generally every 50 to 400 feet. Other trees within these riparian strips were typically much younger conifers and deciduous trees, providing little or no horizontal screening or cover to the much taller residual conifers. Additionally, the upland portion of these riparian stringers were typically bordered by young conifer plantations, which provided virtually no horizontal screening to potential platform trees. These riparian strips also were typically separated by 100 - 300 feet of river and associated gravel bars, which created additional open areas and increased edge exposure. Although trees with potentially suitable platforms were present, they were severely exposed to predators and adverse environmental conditions (higher ambient temperatures, winds, and exposure to rain, etc.). Based on the literature, the amount of edge and exposure are important factors in determining the quality of nesting habitat of a stand (Ralph et al. 1995; USFWS 1998). An important note about these riparian stringers is that most are located within RCRs, which will be conserved as part of the HCP.

2. Another example of stands that met Criteria in Step 3 but not criteria in Step 4 were deciduous dominated stands with a few large remnant older conifer trees, some with potential platforms. These areas were typically found in riparian areas of major streams, such as the Wynoochee River and the major forks of the Satsop River. These stands were dominated by deciduous trees, but contained single or small clumps of older-age coniferous trees (2 - 3 trees) that were 50 - 200 feet apart. The crowns of these conifers were typically well above surrounding deciduous trees, and there was little horizontal screening or cover to protect potential nest sites from predation. Again, almost all of these areas were located within RCRs, which will be conserved as part of this HCP.

3. The third example of stands that were not considered murrelet habitat were coniferous stands containing conifer trees with platforms (typically mistletoe booms in western hemlock) that were in dense stands with a high canopy cover (greater than 90 percent for the stand). Very few, if any, gaps in the canopy were present in these stands. These stands were located on relatively flat areas also reducing exposure of individual tree canopies. As a result, it is virtually impossible for a marbled murrelet flying 50 miles per hour or more to access platforms within these dense, single canopy layer stands. These areas were typically were located in upland areas outside RCRs.

Step 5: During 1997 murrelet habitat in the Plan Area was classified into survey sites in preparation for the murrelet species surveys in 1998. As part of this process, potential habitat on ownerships adjacent to habitat on Simpson lands also was evaluated to determine if it should be included as continuous suitable habitat. The inventory results from 1994, also were further examined in 1997 and 1998, as part of this HCP project, to ensure decisions made from the 1994 inventory still apply.

Bald Eagle (Haliaetus leucocephalus)
The bald eagle is found in and around the Plan Area throughout the year. It primarily nests in coniferous uneven-aged stands with old-growth tree components, with a low level of human disturbance and an abundance of prey (Anthony et al. 1982, Livingston et al. 1990). Nest building begins as early as January or February with egg lying initiated in March or early April, and fledging occurring in July. Nest trees typically are in older and large (greater than 32 inches DBH) dominant or co-dominant trees with large limb structures capable of holding the large nests.

Bald eagle communal roosts are any stand of trees in which eagles regularly roost together. Bald eagles often roost communally during the night, especially during late fall, winter and early spring. They also will communally use these areas during daylight hours. Staging areas are stands of trees near communal roosts where eagles gather before and after flights to and from the roost.. Roost site management plans typically divide roost sites into core areas and buffers zone designations for management purposes.

Surveys: Formal or comprehensive surveys of bald eagles and their nest sites have not been conducted in the Plan Area. One communal roost site has been verified to exist, and it is located on the steep valley side slopes of the North Fork Skokomish River, near the confluence with the South Fork Skokomish River. This site supports approximately 30 bald eagles primarily during September to February each year.

Band-tailed Pigeon (*Columba fasciata*)
The Pacific coast population of band-tailed pigeons occurs from British Columbia to Baja, California, and within most western states (Urdvardy 1977). Band-tails winter from southern California and Arizona through Central America (Terres 1991). They inhabit areas from sea level to timberline and are believed to occur throughout the Plan Area.
The band-tailed pigeon nests in mature or old-growth coniferous and coniferous/deciduous forests usually at elevations less than 1,000 feet, using dominant trees for calling and display flights. Nesting occurs from May through July with an 18-20 day incubation period. Band-tails usually nest in scattered pairs, but occasionally will nest in “colonies” in one tree (Terres 1991). Nests have been found 8 to 40 feet or more from the ground in coniferous and deciduous trees (Terres 1991). Preferred forage species are seed and berry producing shrubs and trees, such as: cascara, elderberry, and blackberry. Calcium and possibly other minerals derived from mineral springs are believed to be important to this bird immediately before and during breeding and nesting season (Terres 1991).

Annual censuses of these birds coordinated by the USFWS have shown the population declined significantly during the past 10 years. This decline is possibly due to a combination of the following factors: 1) loss of winter habitat; 2) loss of foraging habitat due to land use and herbicide spraying; and 3) over hunting.

Surveys: Some small scale sampling has been accomplished for this species in the Plan Area, as part of the Washington State-wide annual voluntary bird census conducted by the Audubon Society and other groups. Band-tails are found each year in the Plan Area, during these surveys, however the small extent of this survey and the limited number of years in which it has been conducted do not provide reliable estimate, at this time, of long-term population trends in the Plan Area.

Harlequin Duck (Histrionicus histrionicus)
Harlequin ducks winter offshore along the Pacific coast from eastern Siberia and Alaska to northern California (Erlich et al. 1988). In the summer they breed on rocky coastal islets and along inland rivers as far east as the Sierra Nevada and northern Rocky Mountain ranges (Urvardy 1977).

The harlequin typically nests within 90 feet of fast-flowing streams from April through June (Ehrlich et al. 1988). Nests usually occur in scrapes on the ground and sometimes in tree cavities, low branches or on other low vegetation structures. Nests are usually protected by rocks or shrubs and lined with leaves and down. Harlequins show fidelity to nest sites, but they are unlikely to return if significantly disturbed (Wallen and Groves 1989). Nesting usually occurs in May with 5-10 cream colored eggs (Ehrlich et al. 1988). Incubation is usually 30 days and the young fledge 35-40 days after hatching. Broods remain near nests for a few weeks after fledging, and they move downstream during the summer (Wallen 1987). Broods prefer low-gradient streams (Begton and Ulfstrand) and have been associated with mature and old-growth coniferous forests (Cassirer and Groves 1990).

The harlequin preys on crustaceans, mollusks and aquatic insects (Cotton 1939). They move along the bottom of food-rich fast-flowing streams foraging among the rocks (Ehrlich et al. 1988). Loafing sites along streams are also important places to rest between forages (Cassirer and Groves 1990).

Surveys: The Plan Area includes some optimum habitat for this species, although surveys for this species have only been done sporadically and along only some stretches of the river. The Washington state data base has one historical record of a harlequin in the Plan Area in 1961 (T10S R09W Sec. 30). This species also has been seen on the Satsop and South Fork Skokomish Rivers during surveys conducted by the Washington State DFW during recent years..

Roosevelt Elk (Cervus elaphus Roosevelti)

Roosevelt Elk (CEEL): Roosevelt elk is one of four subspecies of elk remaining in North America and it is found from Vancouver Island, British Columbia to Northern California and west of the Cascade crest. This species was included within this HCP due to the high level of public and tribal interest and because populations are substantially below carrying capacity levels in some portions of the Plan Area.

Roosevelt elk forage on herbaceous (grasses, sedges, forbs and ferns) plants, particularly in the spring through fall, and woody plants, such as shrubs and young trees. They rely on vegetative cover for hiding and to a less extent on external thermal regulation. Elk home ranges vary from approximately 500 to 2,000 acres depending on herd size, quality of habitat, season and harassment. This species can thrive in industrial forest lands; however, intentional and unintentional harassment from humans on roads tends to be the biggest threat to its existence and population health in these types of areas. Elk are pursued as a prime game species, and they are very susceptible to illegal hunting in areas with high amounts of road mileage.

Surveys: The Washington State Department of Fish and Wildlife has periodically conducted surveys during the last ten years in the Plan Area (Schirato pers. comm. 1996). These surveys have produced only general population estimates of some of the elk herds in the Plan Area. Results indicate there are approximately 7 herd territories in the Plan Area, and some herds tend to be broken into numerous subgroups, rather than consistently being together.

Surveys conducted by the Point No Point Treaty Council included approximately the northern one third of the Plan Area, as well as areas north and west of the Plan Area (Nickelson et al.1995, Nickelson and Anderson 1997). Results of these surveys show the portion of the Plan Area north of the Shelton-Matlock, Deckerville and Cougar Smith roads has 78-162 elk, which is believed to be substantially below the number of elk that area could support. The Treaty Council surveys also found very few elk (only 30 found) in an area approximately 60,000 acres in size immediately north of the Plan Area (Nickelson et al. 1995). Comprehensive surveys have not been conducted for elk in the southern half of the Plan Area.

Snag Dependent Species

The following bird species are dependent on snags for a major portion of their life requirements for nesting, roosting or foraging. Snags, within this context, are standing dead or partial dead trees. There is wide variability in these types of trees; however, they all have significant death, structure decay or structural defect (e.g. broken top, dead top, all limbs without life or a significant portion of the limbs without life, and large defects in the tree bole or major limbs leading to cavities in the structure).

All of the snag dependent species listed below are found in the in the Pacific Northwest, and some are wide-ranging over major portions of North America. Our focus here only is on the species Simpson has chosen to include in HCP as “covered” species; other cavity nesting species also inhabit the Plan Area. Table 24, in this appendix, summarizes the habitat requirements of the covered species, as determined from literature. Some habitat requirements are not included in this table because little or no research has been conducted on the species in the Pacific Northwest, or the results were not available for this analysis.

The snag dependent species addressed by this HCP have not been surveyed or inventoried in the Plan Area with systematic and scientifically designed studies. Some on-going annual bird census surveys have recorded some of these species; however, these general surveys were primarily conducted for passerine and neo-tropical species. These annual bird censuses have been conducted by volunteer organizations during past years along major roads, and within small portions of the Plan Area.

Spotted owl surveys were conducted from 1990 to 1993 in many portions of the Plan Area. Biologists conducting those surveys also identified and recorded other owl species, such as saw-whet, screech, pygmy and barred owls (Simpson Timber Company, unpublished data, 1990-1993). That data shows all of those secondary species were present in the Plan Area at the time of the surveys. That information, however, was not summarized for this analysis because the results only pertain to habitats surveyed for spotted owls and the survey methods were only designed to capture spotted owl data. Although the ancillary records of saw-whet, screech, pygmy and barred owls are valuable for noting presence or absence in the Plan Area, those results have limited value for documenting population trends and habitat use patterns for those particular species.

CLASS 1 - SNAG DEPENDENT SPECIES

Downy woodpecker (*Picoides pubescens*)
This species inhabits a variety of coniferous, deciduous and mixed forest types, and typically nests in older second growth and mature forests (Hagar et al. 1995, O’Connell et al. 1993, Thomas et al. 1979, Meslow 1978). They utilize both interior forests and edges for nesting and

foraging, and Hagar et al (1995) found that they favor dense, closed canopy timber stands. Meslow (1978) found that they forage in grass/forb and shrub/sapling stages of west-side second growth Douglas-fir forests; however, those habitats were not used for nesting. Manuwal and Pearson (1997) found that riparian areas are a primary habitat for this species, whereas Hagar et al. (1995) stated there was no preference for riparian or upslope areas.

This species excavates their cavity-nests near the tops of snags or partial dead trees. The nest trees, averaging 8-12 inches DBH and 7-27 feet tall, are located in fairly open tree stands (Brown 1985, Zarnowitz and Manuwal 1985, McClelland et al. 1979, Scott et al. 1977, Conner et al. 1975). They also nest in live trees, especially if heart-rot is present. Generally, they excavate new cavities each year, often in the same tree (Hardin and Evans 1977). They seldom use old cavities or those made by others species (Thomas et al. 1979). They forage mainly on beetles and wood-boring larvae, and on fruits and seeds (Beal 1911), by digging in the bark with their bill, gleaning along the bark surface, and infrequently by flycatching (Jackson 1970). Home ranges vary from 3 to 9 acres (Whitcomb et al. 1981, Lawrence 1967). This species is present in the plan area.

Black-capped chickadee (*Parus atricapillus*)
This species is locally common in the Plan Area. They use multi-seral stage habitats, including open habitats, deciduous forest, young and late successional coniferous and mixed forests, riparian forests, clearcuts and forest edges (Bunnell et al. 1997, DeGraaf 1991, Washington DOE 1985, Thomas et al. 1979, Sturman 1968, Nickell 1956). Meslow (1978) found that they nest in second growth and older second growth stages of west-side second growth Douglas-fir forests. Willow, alder and cottonwood trees also are common nest trees in Washington (Jewett et al. 1953). Some research has shown that this species prefers riparian and deciduous forests (Manuwal and Pearson 1997, Washington DOE 1985, Bunnell et al. unpublished data). Forest edge also is a primary habitat for this species (Bunnell and Chan-McLeod 1997, McGarigal and McComb 1995).

This species nests in forests generally greater than 40 years old by utilizing natural cavities, abandoned woodpecker cavities, or by excavating cavities in soft snags and tree stubs that are typically 9 inches DBH and 10 feet tall (DeGraaf 1991, Brown 1985, Raphael and White 1984, Thomas et al. 1979). They forage by gleaning insects from the bark of tree trunks and logs, in addition to fruit and seeds (Brown 1985).

CLASS 2 - SNAG DEPENDENT SPECIES

Western bluebird (*Sialia mexicana*)
This neo-tropical migrant species inhabits open forests and forest edge habitat that typically is adjacent to grasslands and shrublands (Bunnell and Chan-McLeod 1997, Bunnell et al. 1997, Hagar et al. 1995, Meslow 1978). Hansen et al. (1995) found this species uniquely associated with green-tree retention sites in the Oregon Cascades. They will inhabit clearcuts if nest habitat is present.

This species requires cavities for nesting, often using old woodpecker cavities (Rodrick and Milner 1991, Zeiner et al. 1990, Meslow 1978). Their nest trees average from 15 to 28 inches DBH and from 10 to 30 feet tall (Schreiber and de Calesta 1992, Erlich et al. 1988, Bent 1942). They also utilize nest boxes. Competition from other species such as more aggressive starlings (*Sturnus vularis*) and other native bird species can severely limit bluebird nesting in artificial structures. They forage primarily by "hawking" insects from the ground, including grasslands, shrublands, riparian areas, cliffs, and talus areas (Thomas et al. 1979). Average home ranges have been reported to be 1.13 acres (Zeiner et al. 1990). This species has been found in the plan area.

Purple martin (*Progne subis*)
This neo-tropical migrant species is found at the edges of forests that are typically at least 40 years old and adjacent to lakes, ponds and wetlands where standing trees are in or near water (DeGraaf 1991, Brown 1985). They nest in abandoned woodpecker cavities in snags and live trees with defects generally 15 inches DBH and 10 feet tall (Marshall et al. 1992). These colonial nesters also utilize cavities in cliffs and crevices in old buildings, and will readily use nest boxes near existing colonies (Rodrick and Milner 1991, Brown 1985). They typically forage over open water for insects on the wing (Erhlich et al. 1988) and uses all seral stages of riparian and wetland forests as foraging habitat (Brown 1985). This species occurs in the plan area at Lake Nahwatzel.

Chestnut-backed chickadee (*Parus rufescens*)
In western Washington this species is typically found in mature coniferous forests with a high percentage of overstory canopy cover. It also is found in deciduous and mixed conifer forests (Sturman 1968; Thomas et al. 1979; Jewett et al. 1953; Melow and Wigth 1975; DeGraaf et al. 1991; Nickell 1956). They nest in natural cavities, abandoned woodpecker cavities, or excavate cavities in soft snags and tree stumps. Lundquist and Mariani (1991) found this species typically nesting in trees that average 37 inches dbh in the southern Washington Cascade mountain range, although other research has shown nest trees can vary from 9 to 41 inches DBH (Degraaf et al. 1991; Raphael and White 1984; Brown a985; Thomas et al. 1979). This species forages by gleaning insects from the bark of tree trunks and logs, in addition to fruits and seeds (Brown, 1985).

Red-breasted sapsucker (*Sphyrapicus ruber*)
This neo-tropical migrant species is found in a variety of dense stands of conifer or mixed forests (Hagar et al. 1995). Most literature has identified this species as having preference or secondary preference for old-growth forests (Bunnell and Chan-McLeod 1997, McGarigal and McComb 1995, Schieck et al. 1995, Carey et al. 1991, Lehmkuhl and Ruggiero 1991). Thomas et al. (1979) reported this species prefers habitats in and adjacent to wetlands and riparian areas.

This species excavates cavities in hard snags and tops of live trees that average 15 to 33 inches DBH and 42 to 72 feet tall (Lundquist and Mariani 1991, Raphael and White 1984, Sousa 1983). They forage for insects by drilling holes in live trees and snags and by gleaning bark (DeGraaf et al. 1985, Raphael and White 1984). This species is likely present in the plan area.

Tree swallow (Tachycineta bicolor)

This neo-tropical migrant species nests in medium to large snags (i.e. 24 inches DBH) within open habitats that allow for foraging of insects. Preferred habitats are mature forest (i.e. at least 80 years old) edge habitats adjacent to grasslands, shrublands, clearcuts, open water and wetlands (Bunnell et al. 1997, Carey et al. 1996, Hagar et al. 1995, Hansen et al. 1993, DeGraaf 1991). In Western Washington, Manuwal and Pearson (1997) found the highest abundance in clearcuts.

This species nests in abandoned woodpecker cavities in snags and live trees with defects that are generally 15 inches DBH and 20 feet tall (Marshall et al. 1992, Brown 1985). In western Oregon the average nest snag was 24 inches DBH and 25 feet in height (Schreiber and de Calesta 1992). If cavities are limited, they will readily use nest boxes or nest in crevices of buildings (Scott et al. 1977, Bent 1942). Although tree swallows are not colonial nesters, they will nest within seven feet of each other if there are adequate wetland areas or open water for foraging (Whittle 1926). They typically forage over open water for insects on the wing, but they also feed on seeds and berries more than other swallows (Scott et al. 1977). This species is present in the plan area.

Violet-green swallow (*Tachycineta thalassina*)

Only a small amount of research has been conducted in the Pacific Northwest regarding the habitat needs of this neo-tropical migrant species. That research and other general literature indicates that large diameter (i.e. 38 inches DBH) snags in or adjoining open air foraging areas are the key habitat requirements (Bunnell and Chan-McLeod 1997, Hagar et al. 1995, Schreiber and de Calesta 1992, Brown 1985, Thomas 1979). With the presence of snag habitat, this species typically can inhabit a variety of forest seral age classes and open areas (Washington DOE 1985). This species is associated with, and particularly common in and around, wetlands and riparian areas (Bunnell and Chan-McLeod 1997, Sadoway 1988, Thomas 1979). However, this species may be less dependent on areas with surface water as compared with other swallow species (Sharp 1992). Hagar et al. (1995) found the species strongly favors forests with open canopies and low tree densities, particularly early forest seral stages, but they did not find a significant preference for riparian areas. In western Washington, Manuwal and Pearson (1997) found the highest abundance of this species in clearcuts.

The violet-green swallow nests in large diameter trees with hollow tree boles. Research in western Oregon has found that the average diameter of nest trees was 38 inches DBH and the average height was 38 feet. Other general information indicates that smaller snags (i.e. 15 inches DBH and at least 20 feet tall) may provide nest habitat (Marshall et al. 1992, Brown 1985). This species also may nest in rocky cliffs, burrows of bank swallows, niches of buildings and nest boxes if cavities are scarce (Scott et al. 1977, Bent 1942). They forage almost exclusively for insects taken on the wing in open areas, particularly over open water (DeGraaf et al. 1985, Scott et al. 1977). This species is present in the plan area.

Hairy woodpecker (*Picoides villosus*)

Research in the Pacific Northwest has shown a varying degree of habitat preferences for this species. However, a key habitat requirement is medium and large snags, used for nesting and foraging, and large logs which are used for foraging. Many studies have shown this species has a preference for mature and old-growth forests (Bunnell and Chan-McLeod 1997, Bunnell et al. 1997, Manuwal and Pearson 1997, Lehmkuhl and Ruggiero 1991, Mannan et al. 1980, Sousa 1987, Carey et al. 1991). Studies have shown that typically there is not a strong association for riparian areas (Bunnell and Chan-McLeod 1997, Bunnell et al. 1997, Kessler and Kogut 1985, Washington DOE 1985), although important life requisites are found in riparian areas (Carey et al. 1996). Some literature indicates that this species prefers river bottomland with large trees and that they are generally more abundant at the edge of woodlands (DeGraaf 1991, Zarnowitz and Manuwal 1985). Larrison and Sonnenberg (1968) found hairy woodpeckers in Washington in open rather than dense stands of timber.

Average diameter of nest snags in Western Oregon were found to be 24 inches DBH (Mannan et al. 1980), whereas other literature indicates the average DBH is smaller or larger (refer to Table 24 references). Snag size availability within home ranges effects the preference patterns exhibited by these and other snag dependent bird species. Cavities typically are excavated in soft snags with decaying heartwood (Sousa 1987, Conner et al. 1975). They are opportunistic foragers (Raphael and White 1984), and they will feed on the ground, but primarily forage for insects from snags, stumps and logs with decay classes 1-3 (Hagar et al. 1995, Mannan et al. 1980, Conner and

Crawford 1974, Lawrence 1966). They forage mainly on beetles and wood-boring larvae by drilling or gleaning from the bark, as well as on fruits and seeds (Raphael and White 1984, Beal 1911). This species is present in the plan area.

Western screech owl (*Otus kennicottii*)

This species prefers open forests and forest edges, and riparian forests adjacent to meadows, grasslands and other openings (Bunnell and Chan-McLeod 1997, Hagar et al. 1995, O'Connell et al. 1993, DeGraaf 1991, Brown 1985, Thomas et al. 1979). In western Oregon, Bunnell et al. (1997) reported this species has a high association with old-growth forest, medium with mature forests and low in pole/sapling and young forest age classes. This species appears to be a riparian associate (Hagar et al. 1995, Bunnell et al. unpublished data), and riparian areas provide all primary life requisites (Bunnell and Chan McLeod 1997, Carey et al. 1996). Sadoway (1988) found habitats with standing water are used for foraging and nesting.

This species nests in mature forests that are typically at least 80 years old in natural cavities and abandoned woodpecker and flicker cavities in trees and snags that are generally 17 inches DBH and 20 feet tall (Brown 1985). They will also use nest boxes where cavities are scarce (Hammerstrom 1972). Screech owls hunt for rodents, insects, amphibians and small birds in grassy openings, or along field margins or streams. This species is present in the plan area.

Northern pygmy owl (*Glaucidium gnoma*)

This species inhabits deciduous, coniferous and mixed open forests that are typically at least 40 years old with nesting snags (Bunnell et al. 1997, Hansen et al. 1993, DeGraaf 1991, Thomas et al. 1979). Meslow (1978) found this species nests in older second growth and mature forests, and forages in shrub/sapling and young second growth forests in west-side Douglas-fir forests. Hagar et al. (1995) found that this species strongly favors deadwood (snags and logs) habitat and that they were absent from areas without such habitat. They also use forest edges (Carey et al. 1996). This species uses riparian areas (Bunnell and Chan-McLeod 1997, Carey et al. 1996, Stevens 1995), and some literature reports that it prefers riparian areas and is a riparian associate (Bunnell et al. 1997, Hagar et al. 1995)

This species nests in natural cavities and abandoned woodpecker and flicker cavities in trees and snags that are typically 17 inches DBH and 30 feet tall (Brown 1985). Average home range size has been reported to be 1,130 acres (McComb and Hagar 1992). They prey upon rodents, insects, amphibians and reptiles in open areas. This species is present in the plan area.

Northern saw-whet owl (*Aegolius acadicus*)

This species favors mature, dense closed-canopy forests generally at least 80 years old and swampy areas of coniferous and deciduous forests (DeGraaf 1991; Brown 1985). Meslow (1978) found this species inhabiting second-growth, older second-growth and mature stages of west-side Douglas-fir forests. In British Columbia this species uses mid to late-successional western hemlock forests, and forages near ponds and intermittent ponds (Sadoway 1988, Bunnell et al. unpublished data). Lehmkuhl and Ruggiero (1991) found this species prefers late successional or old-growth forests. Carey et al. 1996 found that some life requisites are found in the competitive exclusion and understory re-initiation stages of reforested timber lands. Forest edge habitats appear to be an important habitat feature for this species (Carey et al. 1996). Meslow (1978) found that this species uses the shrub/sapling stage of west-side second growth Douglas-fir forests, but not for nesting. This species uses riparian areas, but does not show a preference for those areas (Hagar et al. 1995, Stevens 1995, Washington DOE 1985, Bunnell et al. unpublished data). Carey et al. (1996) found that riparian conservation areas alone do not provide suitable habitat for this species.

The northern saw-whet owl typically nests in naturally formed tree cavities, and those made by woodpeckers and flickers (Bunnell et al. 1997, Carey et al. 1996). Nest trees are generally 17 inches DBH and 20 feet tall (Brown 1985, Scott et al. 1977). They also use nest boxes with fibrous nesting material (i.e. saw dust or straw) (Hammerstrom 1972). Ritcey et al. (1988) stated that each individual requires approximately 25 acres of habitat for reproduction and foraging in the summer and that approximately 500 acres is needed to support a minimum population of 20 northern saw-whet owls. Prey species include small mammals, small birds, insects and frogs (DeGraaf 1991). This species is present in the plan area.

Northern flicker (*Colaptes auratus*)

The northern flicker is a common resident in the plan area and it is found in all forest types. They typically forage in open forests, forest edges, thinned forests and openings with nearby forests. The key limiting factor for these populations, in the Plan Area, appears to be the availability of medium to large diameter snags for nesting, and to a less extent, for foraging.

Campbell et al. (1988), Sadoway (1988) and Meslow (1978) found that this species reproduces in older second growth and mature coniferous and deciduous forests in the western region of the Pacific Northwest. In western Oregon flickers were detected more frequently following thinned forests (Weikel and Hayes 1997). In the Western Oregon Cascade Range, Hansen et al. (1995) found flickers were more abundant in thinned forests (5 trees/acre remaining) than in clearcuts. Campbell et al. (1988) found flickers breeding in virtually all forested upland habitats up to 2,100 feet elevation, and found that flickers prefer open habitats but will use dense forests if associated with open areas, clearcuts and burns. In western Washington, Manuwal and Pearson (1997) found the highest abundance of flickers in clearcuts. Marcot (1984) found the highest flicker densities in early shrub/sapling stage during breeding season in managed Douglas-fir forests of Northwest California. In southwest Oregon, Carey et al. (1991) found this species was most abundant in old-growth forest, followed by mature, then young forest.

This species prefers to excavate their cavities for nesting in soft snags or near the top of live trees that are 17 to 27 inches DBH (refer to Table 24 for references). Average snag height ranges from 30 to 72 feet in height (refer to Table 24 for references). They also are known to nest in cavities excavated by others and in nest boxes (DeGraff et al. 1985, Thomas et al. 1979). A large portion of their time is spent foraging in open areas on the ground and in woody debris, for ants, other insects, fruits and seeds. (Moore 1995, Timossi and Barrett 1995, Huff and Raley 1991, Zeiner et al. 1990, Campbell et al. 1988).

Ritcey et al (1988) found that a minimum of approximately 1,000 acres of habitat is needed to support a minimum population of 20 individuals. Zarnowitz and Manuwal (1985) found 4-6 flickers per 100 acres of habitat in northwest Washington; whereas, Carey et al. 1991 found 0.33 birds per 100 acres in young, mature and old-growth forest in the southern Oregon Coast Range. Marcot (1984) found the highest densities (1.9 birds/100 acres) in early shrub/sapling stages, with fewer birds (0.9 birds/100 acres) in late shrub/sapling stages of Douglas-fir forests in northwestern California.

CLASS 3 - SNAG DEPENDENT SPECIES

Pileated woodpecker (*Dryocopus pileatus*)

This species typically is found in mature (>80 years old) or old-growth coniferous forests or in areas with components (patches) of such forests (Rodrick and Milner 1991, Bull et al. 1990, Brown 1985, Thomas et al. 1979). The size and number of late seral forest patches on landscapes appears to have a direct correlation to the number of pileated woodpeckers present (Hagar et al. 1996, McGarigal and McComb 1995, Schieck et al. 1995).

Pileated woodpeckers also can inhabit older second-growth forests (i.e. > 50 years old) that have an adequate number of large snags for nesting/roosting and foraging habitat (Bunnell et al. 1997, Carey et al. 1996, Hagar et al. 1995, Mellen et al. 1992, Lehmkuhl and Ruggiero 1991). In private forest lands in western Washington Cascades, Bosakowski (1997) found the highest correlation of pileated locations was with forests greater than 45 years old. He also found that pole conifer (27-44 years old) and recent clearcuts (0-5 years old) also had significant correlations with pileated woodpecker locations. This correlation with young stands and clearcut edges may have been due to the abundance of wind damaged trees, windthrow and other residual wood resulting from clearcuts and clearcut edges (Bosakowski 1997). Pileated woodpeckers have been observed in Plan Area, particularly in riparian areas with remnant old-growth forest, such as the areas proposed for Late-Seral Forest Reserves (LFR). Riparian habitats appear to be used in proportion to their availability (Hagar et al. 1995, Stevens 1995).

Minimum size of habitats in fragmented forests of the western Olympic Peninsula were approximately 12 acres for foraging and 80 acres for nesting (mature and old forests) (Raley personal communication 1999). Raley also indicated that those habitat patches could be 0.5 miles apart in areas with a relatively low degree of fragmentation, whereas they should average 0.25 miles apart in areas with higher amounts of forest fragmentation.

Pileated woodpeckers excavate cavities for roosting and nesting in large snags and trees that are typically 30 to 34 inches DBH (refer to Table 24 references). Aubry and Raley (1995) found the average snag tree diameter was 40 inches DBH and 130 feet in height on Olympic Peninsula. Approximately 50 percent of the nests found during their research were in live trees with dead tops and the remaining nests were in hard snags (Aubry and Raley 1995). Each pair excavates one or more domed-shaped nest cavities (4 to 5 inches high and 3 to 4 inches wide) per year typically at least 100 feet above the ground. Unused or old nest cavities may be used for night roosts, and individual birds may use up to eight cavities for night roosts. Aubry and Raley (1995) also found 155 roost sites during their studies, 52 percent were in snags, 40 percent in dead-topped trees and 8 percent in sound live trees. Neitro et al. (1985) estimated that six suitable snags per 100 acres are required to maximize the density of breeding pairs of pileated woodpeckers.

Pileateds forage for carpenter ants and other insects by gleaning and excavating in snags, live trees, stumps and downed logs. The average home range size on Olympic Peninsula varies from 2,208 acres for males, 2,321 acres for females and 2,131 acres for pairs. In Oregon, home ranges for individuals averaged 1,181 acres which included an average of 563 acres of suitable (>70 years old) nesting and foraging habitat (Mellen et al. 1992). Aubry and Raley (1995) found that approximately 60 percent of the foraging locations and 88 percent of pileated woodpecker roosting locations were in old and mature forests. They also found that about 14 percent of the foraging locations were in naturally regenerated young forest (75 years), 16 percent in young closed pole forest and 8 percent in open sapling/shrub forest.

Wood duck (*Aix sponsa*)

This species inhabits streams, lakes, ponds, and wetlands (Bellrose 1976). They typically are found in mature (at least 80 years old) and old-growth conifer and mixed forests near water (Bunnell and Chan-McLeod 1997, Bunnell et al. 1997, Hagar et al. 1995, Bellrose and Holm 1991). This species is dependent on wetland or riparian habitat with calm water for important life requisites (Bunnell and Chan-McLeod 1997, Carey et al. 1996). Many literature sources state this species requires vegetative cover around wetlands for foraging, nest cover and protection of young (Knutson and Naef 1997, Sousa and Farmer 1983, Erickson 1974).

Wood ducks utilize natural cavities or those abandoned by woodpeckers in defective trees and snags that are generally 25 inches DBH and 10 feet tall (Bellrose and Hepp 1995, Bellrose and Holm 1991). Where cavities are limited, they will nest in artificial boxes if protected from predators (Bellrose et al. 1964). They forage on the ground or in water on plants, seeds, fruits and invertebrates (Landers et al. 1977). This species is present in the plan area.

Common merganser (*Mergus merganser*)

This species prefers clear, cool ponds associated with upper portions of rivers and clear freshwater lakes with forested shorelines (Johnsgard 1975). They usually nest in mature forests generally at least 80 years old, nesting in natural cavities in trees and snags that are typically 25 inches DBH and 10 feet tall (DeGraaf 1991, Brown 1985). Unlike other cavity-nesters they do not use abandoned woodpecker cavities. Tree species and height may not be extremely important (Foreman 1976). Although tree nests are typically chosen by this species, ground nests under thick cover or in rock crevices are not uncommon (Scott et al. 1977). They will also use a wide variety of other locations such as nest boxes, chimneys, hawk nests, bridge supports and old buildings (Scott et al. 1977). Nests are typically within 100 feet of water (Palmer 1976). They forage in shallow waters (1 to 6 feet deep) primarily on a wide variety of fish, although they also feed on amphibians, crustaceans, insects and plants (Palmer 1976). This species is present in the plan Area.

Table 24. Snag dependent wildlife species that inhabit or could inhabit the Plan Area, and their habitat requirements.

Class[a]	Species	Snag/Tree Description: Average size of nesting/roosting [a] snags (references in superscript) DBH (inches)	Height (feet)	Minimum size of snag [b] (references in superscript) DBH (inches)	Height (feet)	Snag Abundance (#/acre)	Habitat type and location [b, c] F = foraging habitat R = reproductive habitat
1	Downy woodpecker	8-11 [1, 16, 24]	20-43 [20]	6 [2]	10 [1], 15 [2]	1 [51] 1.6 [1] 3 [2]	Excavates cavities in hard/soft snags and trees, prefers deciduous trees, found in all wooded habitats: deciduous/conifer, riparian areas, adjacent to wetlands and lakes F/R 40+ yr. old forests
1	Black-capped chickadee	4-9 [1, 24, 79]		4 [2, 24]	6-10 [1, 2]	2 [48]	Multi-seral stage habitats, including open habitats, deciduous, young and late successional coniferous and mixed forests, riparian forests, clearcuts and forest edges F- open areas, shrub, open water, wetlands, feeds by gleaning throughout the forest canopy R - young forest 40+ yr. old edges adjacent to wetlands, utilizes stumps
2	Chestnut-backed chickadee	25-30 [24, 16] 37-40 [6, 7]	58 [6]	17 [9]			Prefers mature and old-growth forest if present, but will also inhabit older second growth, uses riparian areas and forest edges F - gleans insects from bark and foliage in mid and lower canopies R - excavates cavities in soft snags
2	Western bluebird	15-19 [1, 4, 6]		10 – 15 [1, 2]	6-10 [1, 2]		Primarily an edge species - forest edges and open areas F - grass, shrub, wetlands, cliffs, talus R - 40+ yr. old conifer/mixed/deciduous forest, nests in cavities in trees adjacent to openings, prefers class 5 snags, utilizes stumps, and nest boxes
2	Purple martin	15-21 [1, 4]			10 [1]		Within 200' of wetlands in forests > 40 yrs. old, edges adjacent to lakes and ponds F - over open water and wetlands R - trees, snags, and nest boxes
2	Red-breasted sapsucker	15-33 [1, 6, 12, 87]	50-72 [6, 12, 87]	15-18 [1, 87]	20 [1]	0.5 [1] 0.6 [41]	Found in a variety of mixed/conifer forests, primarily late seral stages, riparian areas also used F - mostly gleaning insects on live trees, some drilling and flycatching R - excavates cavities in hard snags/trees, dead tree tops (class 4) but not class 6 snags

(a) Size classes (inches DBH) 1= 8.0 -14.0 inches DBH; 2=14.1-20.0 inches; 3= >20.0-inches
(b) Foraging shown as "F" and reproduction (nesting) shown as "R". If no "F" or "R" designation than assume size is for reproduction.
(c) Old-age forests are >100 years old, and old-growth forests are >120 years old.

Table 24 (continued). Snag dependent wildlife species that inhabit or could inhabit the Plan Area, and their habitat requirements.

Class[a]	Species	Snag/Tree Description: Average size of nesting/roosting [a] snags (references in superscript) DBH (inches)	Height (feet)	Minimum size of snag [b] (references in superscript) DBH (inches)	Height (feet)	Snag Abundance (#/acre)	Habitat type and location [b, c] F = foraging habitat R = reproductive habitat
2	Tree swallow	15-19 [1, 4, 24] 24-25 [16, 56]	25 [56]	15 [2]	10-20 [1, 2]		Deciduous/mixed/conifer forest edge habitat, riparian forests F - above water, grass, shrub, clearcuts, meadows, young forests R - medium to large snags near open foraging areas, nest boxes also are used when available
2	Violet-green swallow	38 [56]	38 [56]	17-62 [56]	12-62 [56]		R - hollow cavity in dead or partially dead tree in or nearby forest edge, riparian, wetland or a variety of forest ages F - openings above water, grass, shrub, meadows, forests
2	Hairy woodpecker	14-17 [1, 4, 8, 12, 24, 50] 21-23 [16, 33] 29-36 [6, 7]	30-59 [8, 10, 12, 20] 66-95 [6, 7, 9, 33]	F- 5-10 [2, 7]	15-20 [1, 2, 7]	1.8 – 6 [1, 2, 44, 50, 75, 77]	Typically inhabits mature (80 yrs. +) and old-growth forests, will use riparian areas but not necessarily preferred F - forages on snags with average 24 inches DBH and in decay classes 2-3 and logs with decay classes 1-3 R - excavates cavities primarily in soft snags (class 4+) and typically in mature and old-growth coniferous forests
2	Western screech owl	17 [1]		12 [2]	15-20 [1, 2]	0.4 [49]	Woodland habitats near open areas, riparian areas, also farmlands and urban habitats F/R - nests in hard snags/trees along edges between grass, shrub, open forests of all ages snags, cliffs, talus, also cavities in banks and cliffs, may nest in forests 40+ yr. old and 80+ yr. old deciduous/mixed, riparian forests
2	Northern pigmy owl	17 [1]		12 [2]	30 [1, 2]		Will forage in forest types of most all ages but requires snags for nesting F - edges between grass, shrub, open forests, cliffs, talus R - cavities in medium and large snags
2	Northern saw-whet owl	17-20 [1, 4, 24]			15-20 [2]		Forests with dense closed canopy forests, prefers older second growth (i.e.>50 years old) and mid to late-successional forests F - forest understory, forest edges and openings within forests R - natural cavities and woodpecker formed cavities

(a) Size classes (inches DBH) 1= 8.0 -14.0 inches DBH; 2=14.1-20.0 inches; 3= >20.0-inches
(b) Foraging shown as “F” and reproduction (nesting) shown as “R”. If no “F” or “R” designation than assume size is for reproduction.
(c) Old-age forests are >100 years old, and old-growth forests are >120 years old.

Table 24 (continued). Snag dependent wildlife species that inhabit or could inhabit the Plan Area, and their habitat requirements.

Class [a]	Species	Snag/Tree Description: Average size of nesting/roosting snags [a] (references in superscript) DBH (inches)	Height (feet)	Minimum size of snag [b] (references in superscript) DBH (inches)	Height (feet)	Snag Abundance (#/acre)	Habitat type and location [b, c] F = foraging habitat, R = reproductive habitat
2	Northern flicker	17-21 [1,16,24,29,33,58] 22-27 [7,8,12, 55, 56, 57]	30-72 [8,9,10,12,20, 33, 57, 58]	7-19 [2, 53]	6-10 [1,2, 12, 55, 56]	0.4-0.5 [1,2,40,52] 1.2 [44]	Excavates cavities in soft snags, found in conifer, deciduous, mixed, and thinned forests, prefers open areas within or nearby forest areas with log debris F - forages on ground, woody debris and snags in and near riparian and upland forests of all ages R - medium and large snags in or nearby forests and openings, forest edges
3	Pileated woodpecker	20-25 [8] 30-34 [2,4,6,7,8,9, 10,33,84]	31-65 [20] 82-130 [6, 8, 9, 10, 33, 84, 85]	F – 37-49 [7, 84]	31-40 [7, 85]	F – 9.3 [84] R – 1.0-3.2 [43] 0.14 [2, 45] 0.45 [44]	Excavates cavities in hard/soft snags/trees, typically found in mature or older conifer/mixed forests or areas with patches of such forest F - large snags/trees/logs/stumps in 80+ yr. old, will forage in openings and clearcuts that have large logs, stumps and snags R - large snags and dead top trees, typically in 80+ yr. old forests
3	Vaux's swift	25-27 [1, 86]		20 [2]	31-40 [1, 2]		Large hollow trees found in mature 80+ year old conifer forests F - over forest canopy of all ages and talus R - hollow large snags in 80+ yr. old forest [1,2] and cliffs, colonial roost/nester

(a) Size classes (inches DBH) 1= 8.0 -14.0 inches DBH; 2=14.1-20.0 inches; 3= >20.0-inches
(b) Foraging shown as "F" and reproduction (nesting) shown as "R". If no "F" or "R" designation than assume size is for reproduction.
(c) Old-age forests are greater than 100 years old, and old-growth forests are greater than 120 years old.

Table 24 (continued). Snag dependent wildlife species that inhabit or could inhabit the Plan Area, and their habitat requirements.

Class [a]	Species	Snag/Tree Description: Average size of nesting/roosting [a] snags (references in superscript) DBH (inches)	Height (feet)	Minimum size of snag [b] (references in superscript) DBH (inches)	Height (feet)	Snag Abundance (#/acre)	Habitat type and location [b, c] F = foraging habitat, R = reproductive habitat
3	Wood duck	24-39 [1, 88, 89]		12 [2, 88]	6-10 [1, 2]		Within 200 feet of wetlands, deciduous/mixed forests in or adjacent to low gradient rivers, sloughs, lakes, ponds, wetlands, vegetative cover needed F - wetlands, open water, riparian, grasslands to old-growth forests R - 80+ yr. old, riparian forests, utilizes nest boxes
3	Common merganser	25 [1]		15 [2]	6-10 [1, 2]		Within 200 feet of wetlands, 80+ yr. old forests in or adjacent to low gradient rivers, sloughs, lakes, ponds, wetlands F - wetlands, open water, riparian, grasslands to old-growth forests R - 80+ yr. old riparian forests, utilizes nest boxes

(a) Size classes (inches DBH) 1= 8.0 -14.0 inches DBH; 2=14.1-20.0 inches; 3= >20.0-inches
(b) Foraging shown as “F” and reproduction (nesting) shown as “R”. If no “F” or “R” designation than assume size is for reproduction.
(c) Old-age forests are greater than 100 years old, and old-growth forests are greater than 120 years old.

References for size classes: and location of study:

(1) Brown 1985 [W WA/OR]; (2) Thomas et al. 1979 [NE OR]; (4) Scott et al. 1980 [Western US]; (6) Lundquist and Mariani 1991 [Southern WA Cascades]; (7) Mannan et al. 1980 [W OR]; (8) Madsen 1985 [NE WA - Okan.]; (9) McClelland 1977 [N Rocky Mnts]; (10) Bull 1980 [NE OR]; (12) Raphael and White 1984 [Sierra Nev - CA]; (16) Zarnowitz and Manuwal 1985 [NW WA]; (20) Morrison et al. 1983 [WA/OR]; (24) McClelland et al. 1979 [E WA?]; (29) Gutzwiller and Anderson 1987 [WY]; (33) Bevis 1994 [Central WA Cas]; (40) Pugh and Pugh 1957 [CA]; (41) Beaver 1972 [CA]; (43) Bull and Holthausen 1993 [NE OR]; (44) Thomas et al. 1976 [NE OR]; (45) Bull and Meslow 1977 [NE OR]; (48) Schroeder 1983a [US- general]; (49) Garrison 1988 [US- general]; (50) Sousa 1987 [US- general]; (51) Schroeder 1983b [US- general]; (52) Moore 1995; (53) Zeiner et al. 1990; (55) Schreiber 1987; (56) Schreiber and de Calesta 1992; (57) Bull et al. 1992; (58) Harestad and Keisker 1989; (75) Thomas 1979; (77) Bednarz et al. 1998; (79) Kessler and Kogut 1985; (83) Bull 1987; (84) K. Aubry and C.Raley unpublished; (85) Bull et al. 1992; (86) Bull and Cooper 1991; (87) Sousa 1983; (88) Bellrose and Hepp 1995; (89) Sousa and Farmer 1983

Appendix B: Riparian Guidelines

Riparian Strategies

Eight riparian strategies were defined by identifying the functional needs of groups of closely related channel classes and the dominant interactions of each channel class groups with their riparian forest (Table 25). It is the intent of Simpson's riparian strategies to meet the functional needs and provide for the dominant riparian forest interactions of each channel class by: (1) specifying a point of measurement and minimum and average widths (Table 26); (2) designating management guidelines for the RCR (Table 27); and (3) specifying guidance for harvest unit layout adjacent to streams through narrative descriptions of each riparian strategy. These narrative descriptions pertain to the functional characteristics of groups of channel classes and integrate information about the plant potential of riparian settings and natural disturbances likely to occur in those settings. By including the narratives, Simpson intends to provide information for its foresters to consider in the course of harvest unit layout to provide the maximum level of riparian protection within the specified quantitative boundaries outlined in the prescriptions (i.e., Tables 28 and 29). Specifically, the narratives are included to provide insight into how variable width buffers might be designed to optimize ecological function and obtain maximum environmental benefits within the described boundary limitations.

Canyon

The primary management function of the *Canyon* riparian strategy is the provision of LWD from off site, and maintenance of on site shade and detrital inputs. The purpose of this strategy is to maintain the sediment and organic matter storage capacity of the upper channel network, keep convective heat transfer to a minimum and supply detritus to the channel as its principle energy source. This strategy will be applied in the Crescent Uplands (CUP) LTU unit along the highly confined channel network of the Olympic foothills. No current harvest is taking place in these stands (most were logged for the first time only in the 50's and 60's) and no streamside trees were retained at that time.

The retention of sediment behind debris dams, in otherwise sediment limited channel reaches, is the dominant physical process Simpson will be managing. If this capacity is reduced by the break up of storage structures (LWD dams), the sediment will be carried to downstream reaches where it accumulates in flatter channel segments (ROP-C7) along the foothills front boundary. Salmon and trout habitat is thus compromised by the filling of pools and loss of surface flow in the summer. There may be some opportunity for management of these riparian leave areas but the plantations are still young and terrain would require cable thinning or helicopter operations. Leave areas will not be uniform in width, but concentrated in areas that have a high probability of contributing LWD to the channel network. Leave areas will also be fashioned to maintain refugia for stream breeding amphibians.

Channel Migration

The primary management function of the *Channel Migration* riparian strategy is the retention of sediment and organic matter and maintenance of nutrient processing. Numerous other riparian forest functions will be provided by default through this strategy including, bank stability and the growth of very large specimen cedar and spruce for ultimate contribution of LWD. The purpose of this strategy is to maintain the floodplain processes that contribute to nutrient processing within the soil and the hyporheic[23] zone and ensure continued development of topographic complexity of floodplain surfaces. The *Channel Migration* riparian strategy is being applied to two settings; either very large meandering alluvial channels inset within well defined terrace systems or those low gradient smaller channels with highly erodible banks, (e.g. AGL-Qa6, CIS-Qc3, or SIG-M6 channel segments in the Alpine Glacial, Crescent Islands, and Sedimentary Inner Gorges LTUs respectively).

This strategy recognizes flood flow bank erosion, including uncommon but inevitable channel avulsions as the principal disturbance agent for these channel types and their riparian forests. Cutting boundaries Table 26 and Table 27) guarantee that when channel avulsions occur, suitable riparian forest corridors will be adjacent to the new channel. The expected result due to implementation of this strategy is the continued development of floodplain complexity and micro-topography including the many types of small channels that are important for overwintering habitat of salmonids, especially coho salmon.

Temperature Sensitive

The primary management function of the *Temperature Sensitive* riparian strategy is shade and the control of streamside air temperature. The purpose of this strategy is the mediation of water temperatures in channels that are vulnerable to summer time increases. This strategy is being proposed for channel class ROP-Qc3. Temperature is an issue elsewhere as well but this is an especially important channel class in terms of fish utilization and miles. Cutting boundaries should be established that provide the greatest shade from the mid-day to the early afternoon. This may result in a wider, denser leave area on south and west aspects. All of these channels have very low summer flows and ample supplies of gravel which frequently form broad riffles over which the water flows in thin layers exposing it to conductive heat transfer. Maintenance of adequate shade over these streams will provide a better rearing environment for coho, cutthroat, and steelhead.

Inner Gorge

The primary management function of the *Inner Gorge* riparian strategy is the provision of LWD from unstable slopes. The purpose of this strategy is to provide wood large enough to maintain position or lodge in channel classes like SIG-L4, SIG-M5, AGL-Qo8, and AGL-Qa6 channels. Although function of LWD changes in channels of this size and the architecture of LWD accumulations is different, it is nonetheless very important to the development of productive main river habitat. Trees in second growth forests today are just approaching a size that produces functional LWD in large channels. It would be desirable for them to attain additional size before they are recruited to the main rivers. To accomplish this the timber harvest boundary is set back from directly delivering inner gorge side slopes. Floodplain complexity will be enhanced by this strategy over the long run. Maintenance or creation of this kind of habitat is important in these channels due to their relatively confined character. Growing big wood fast is the goal of this strategy. Within this strategy there should be significant opportunity for active management. However, in these areas the largest trees that have the highest likelihood of recruiting to the river must be retained.

[23] The hyporheic zone consists of subsurface gravels and interstitial waters which mix with surface and groundwater. Recent research has shown that important biological and chemical processes occur in the hyporheic zone that contribute to the productivity of surface waters.

Alluvial Bedrock Transition

The primary management function of the *Alluvial Bedrock Transition* riparian strategy is the provision of LWD. The purpose of this strategy is the maintenance of an alluvial channel bed in channel classes likely to scour to bedrock in the absence of LWD. (A minimum diameter of about 0.8 m is needed before LWD is functional in these channels). This strategy will be applied along channel classes SIG-M3 and SIG-M4 channels. The principal recruitment zone for high value LWD is at and just beyond the break in slope.

Valley walls of these channel types are overlain with a thin mantle of soil which is quite unstable. The valley walls may never have produced many large conifer making it especially important to produce them on surfaces that are stable long enough to recruit trees of large size and where they will be delivered to the stream. Unless a supply of LWD is provided to these streams over time they will loose their alluvial character because they have no connection to upland channel networks where weathering bedrock and mass wasting contribute a continual flow of colluvium for fluvial processing. The focus of stand manipulation in this strategy is to grow big conifers fast, requiring considerable silvicultural intervention since many stands adjacent to these channels are dense western hemlock. Sitka spruce grows rapidly in these settings and care should be taken to release younger individuals in the understory.

Break in Slope

The primary management function of the *Break in Slope* riparian strategy is the provision of LWD. A wide range of channel classes are assigned this strategy (Table 25). Cutting boundaries should be moved back away from the break in slope with emphasis being given to wind and shade protection of south and west aspects. As with the Alluvial Bedrock Transition riparian strategy, the boundary needs to be back because the inner side slopes adjacent to the channel are not the surfaces from which conifer LWD is recruited.

In the AGL, the cemented gravels of the side slope are overlain with thin soils and the boundary horizon accumulates water. Alder, salmonberry, and devils club predominate on those slopes. The smaller of these channels dry up in the summer but are used by juvenile steelhead for winter refuge. Without LWD the pools needed for winter resting are not maintained as the channel reverts to plane bed morphology. In the larger channels the same pools are needed for the maintenance of older year classes of cutthroat trout and coho throughout the year. This strategy provides ample opportunity for active management as the surfaces above the break in slope are suitable for ground based logging systems.

Reverse Break in Slope

Primary management functions targeted by the *Reverse Break in Slope* strategy are the provision of LWD and nurse logs. The purpose of providing nurse logs is to maintain conifer germination sites in an otherwise unfavorable environment. LWD is needed for creating channel complexity. This strategy is being proposed adjacent to channel classes SIG-L2 and AGL-Qo4 (Table 25). The proposed cutting boundaries for these sites should retain a conifer component for establishment of large trees for eventual recruitment of LWD to the channel and the forest floor. These settings are typified by wet understory plant communities whose early seral stages are dominated by red alder. After the first logging, these sites reverted to alder and today present one of the most difficult riparian recovery challenges.

Channels traversing these valleys are low to moderate gradient and provide potentially very good fish habitat. Most of the wood left in these channels today is residual old growth and is in advanced stages of decay. Without new wood recruitment over the next several decades to direct the erosive energy of the streams in forming new pools, pool spacing will go up with commensurate loss of habitat for older year classes of trout. Red alder stands adjacent to these channels are at their peak of vigor now and will be declining over the next thirty years. The few scattered conifer saplings that can be found in the understory are currently suppressed but represent a valuable resource for the future. All conifers should be maintained in the understory and a conifer component should be retained in the outermost riparian boundary.

Unstable Slopes/Intermittent Flow

The purpose of the *Intermittent Flow* riparian strategy is to maintain important functional linkages between channel segments and their riparian areas for channel classes that typically have low average fish resource value. However, this strategy explicitly recognizes that physical processes may transmit significant impacts from these channel classes, downstream to other channel segments of the same class or those of other classes that are longitudinally connected, and for which on-site biological resource value is high. This group of channel classes is highly diverse, lies at the tip of the channel network in all LTUs, and constitutes the smallest of channels but the preponderance of the total actual channel mileage. In the majority of cases, segments of these channel classes will not support fish, but within a class, there is substantial variance with respect to physical condition and the presence of particular species.

Where any species of fish are present, a 20 meter average (3 acres per 1,000 feet), no harvest, continuous buffer outside the channel disturbance zone will be retained in a pattern that optimizes functional needs for specific channel classes. See Appendix E for more details about functional characteristics of specific channel classes. Unstable slopes adjacent to these channel classes will also be afforded continuous protection.

Where no fish are present and no instability exists, 80 trees per 1,000 feet of channel shall be retained that are representative of the pre-harvest stand size distribution and species composition. In these cases, leave trees should be clumped in patches designed to optimize the functional needs for specific channel classes. The clumping of leave trees along non-fish bearing portions of these channel classes will provide discontinuous forest fragments for recruitment of LWD and immediate protection for stream breeding amphibians in the perennial segments. The majority of segments afforded this strategy will be intermittent.

Table 25. Key to channel classification scheme and its relation to riparian strategies.

Channel Classifiers		
Channel Width (CW)	**Confinement by Valley Width (VW) to CW Ratio**	**Channel Bed Morphology**
Small = 0 - 4 m Medium = 4 - 16 m Large = > 16 m	Highly confined = VW < 2 X CW Moderately confined = VW 2 - 4 X CW Unconfined = VW > 4 X CW	Bedrock = BD Cascade = Cas Step-pool = SP Forced step pool = SP_f Plane-bed = PB Forced pool riffle = PR_f Pool riffle = PR Braided = BR

Lithotopo Unit				
Crescent Uplands (CUP)	Recessional Outwash Plain (ROP)	Crescent Islands (CIS)	Sedimentary Inner Gorges (SIG)	Alpine Glacial (AGL)
CUP-C1 = Sm, HC, Cas/BD CUP-C2 = Sm, HC, SP/Cas CUP-C3 = Sm, HC, SP_f/SP CUP-C4 = Md, HC, SP/BD CUP-C5 = Md, MC, SP_f/PB CUP-C6 = Md, HC, SP/PB CUP-C8 = Lg, HC, SP/PB	ROP-C7 = Md, UC, BR/PB/PR_f ROP-Qa7 = Lg, UC, BR ROP-Qc1 = Sm, UC, PR_f **ROP-Qc2 = Sm, HC, PR_f /SP_f** ROP-Qc3 = Md, UC, PR_f/PR **ROP-Qc4 = Md, HC, PB/PR_f** **ROP-Qc5 = Md, HC, PB/PR_f** ROP-Qc6 = Md, UC, PR ROP-Qc7 = Lg, MC, PR/BR ROP-Qc8 = Lg, MC, PR/PB	CIS-C1 = Sm, HC, SP_f CIS-C5 = Md, MC-UC, PR_f/PB CIS-Qc1 = Sm, HC, SP_f CIS-Qc2 = Sm, MC-UC, PR_f CIS-Qc3 = Md, UC, PR_f/PR	SIG-L1 = Sm, HC, SP_f SIG-L2 = Sm, MC,PR_f/PR **SIG-L3 = Md, HC, SP_f/BD** **SIG-L4 = Lg, HC, PR/PB** SIG-M1 = Sm, HC, SP_f SIG-M2 = Sm, MC, PR_f **SIG-M3 = Md, HC, BD /PR_f** **SIG-M4 = Md, MC, BD/PR_f** **SIG-M5 = Lg, HC, PR/PB** SIG-M6 = Md, UC, PR SIG-Qa6 = Lg, UC, PR SIG-Qc1 = Sm, HC, SP_f SIG-Qc2 = Sm, MC-UC, PR_f SIG-Qc3 = Md, MC-UC, PR_f SIG-Qo1 = Sm, HC, SP_f/SP SIG-Qo2 = Sm, MC-UC, PR_f **SIG-Qo3 = Md, HC, PR_f/SP_f** **SIG-Qo4 = Md, MC, PR_f/PB**	AGL-Qa6 = Lg, UC, PR AGL-Qo1 = Sm, HC, SP_f/SP AGL-Qo2 = Sm, MC-UC, PR_f **AGL-Qo3 = Sm, HC, PR_f/SP_f** AGL-Qo4 = Md, UC, PR_f /PB **AGL-Qo5 = Md, HC, PR_f** **AGL-Qo6 = Md, HC-MC, PR_f/PB** **AGL-Qo7 = Lg, HC, PR/PB** **AGL-Qo8 = Lg, HC, SP/PB**

Riparian Strategies							
Canyon	Channel Migration	**Break in Slope**	**Inner Gorge**	Unstable and Intermittent	Reverse Break in Slope	Temperature Sensitive	**Alluvial Bedrock Transition**

Table 26. Riparian management area widths and associated guidelines by channel class. *Narrative objectives for each riparian strategy are provided in preceding text.*

Channel Class	Miles	Avg. Width[24]	Min. Width	Measured From	Riparian Strategy	Guide	Type locale Stream and GIS Segment No.
AGL-Qa6	12.7	40/30	25	CMZ	Channel migration	3	Wynoochee; 11/20/8; 25262
AGL-Qo1	61.3	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 6/20/7; 26100
AGL-Qo2	22.5	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 29/21/7; 42518
AGL-Qo3	7.3	25/15	10	BIS	Break in slope	2	Unnamed; 14/20/8; 24979
AGL-Qo4	2.6	30/20	20	CDZ	Reverse break in slope	3	Unnamed; 35/21/8; 26812
AGL-Qo5	8.8	20/10	5	BIS	Break in slope	2	Unnamed; 14/20/8; 24831
AGL-Qo6	13.6	30/20	10	BIS	Break in slope	2	Schafer; 32/21/7; 26659
AGL-Qo7	3.7	30/20	10	BIS	Break in slope	2	Schafer; 24/20/8; 23838
AGL-Qo8	5.2	30	20	BIS	Inner gorge	2	Wynoochee; 12/21/8; 30865
CIS-C1	83.9	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 15/19/4; 17265
CIS-C5	1.7	40/30	20	CDZ	Reverse break in slope	3	Rock; 23/19/5; 16046
CIS-Qc1	33.3	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 16/19/4; 17055
CIS-Qc2	28.0	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 16/19/4; 17350
CIS-Qc3	16.8	30/25	20	CMZ	Channel migration	3	Kennedy; 31/19/3; 12238
CUP-C1	199.9	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 24/21/6; 2900
CUP-C2	22.9	25	15	CDZ	Canyon	1	Unnamed; 17/21/5; 29607
CUP-C3	24.5	25	15	CDZ	Canyon	1	Unnamed; 17/21/5; 29535
CUP-C4	4.9	25	15	CDZ	Canyon	1	N. Mtn.; 17/21/5; 29241
CUP-C5	3.5	25	15	CMZ	Canyon	3	Dry Bed; 13/21/6; 29150
CUP-C6	3.6	30	20	CDZ	Canyon	1	Baker; 16/21/6; 30414
CUP-C8	5.9	35	25	BIS	Inner gorge	2	M Fk Satsop; 16/21/6; 29741
ROP-C7	9.4	40/40	20	OHW	Channel migration	3	N Mtn; 21/21/5; 27963
ROP-Qa7	3.7	50/40	30	CMZ	Channel migration	3	Vance; 10/21/5; 31355
ROP-Qc1	167.3	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 28/20/5; 22360
ROP-Qc2	103.4	3/1	0	BIS	Break in slope	2	Unnamed; 29/20/5; 22697
ROP-Qc3	44.2	30/25	20	CMZ	Temperature sensitive	3	Glenn; 33/20/5; 21864
ROP-Qc4	9.1	20/15	10	BIS	Break in slope	2	Unnamed; 31/21/5; 26917
ROP-Qc5	12.1	30/20	15	BIS	Break in slope	2	Bingham; 36/20/6; 21088
ROP-Qc6	9.5	40/30	20	BIS	Channel migration	2	Decker; 31/20/6; 21845
ROP-Qc7	15.2	65/40	30	CMZ	Channel migration	3	Stillwater; 32/20/5; 20675
ROP-Qc8	2.8	40	30	BIS	Channel migration	3	E. Fk. Satsop; 21/19/6; 16167
SIG-L1	160.0	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 23/21/7; 29219
SIG-L2	38.5	30/20	20	CDZ	Reverse break in slope	1	Unnamed; 34/19/6; 12478
SIG-L3	6.3	20/15	10	BIS	Break in slope	2	Unnamed; 24/21/7; 28809
SIG-L4	24.2	40[25]	25	BIS	Inner gorge	2	W. Fk. Satsop; 34/21/7; 26789
SIG-M1	67.8	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 3/18/6; 11250
SIG-M2	18.5	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 32/20/7; 21375
SIG-M3	9.6	30/15	10	BIS	Alluvial/bedrock	2	Unnamed; 3/20/7; 26221
SIG-M4	6.0	40/25	20	BIS	Alluvial/bedrock	2	Sandstone; 9/20/7; 25521
SIG-M5	15.1	40	25	BIS	Inner gorge	2	Canyon; 10/20/7; 24873
SIG-M6	2.3	50/30	30	CMZ	Channel migration	3	Cook; 4/18/6; 11122
SIG-Qa6	11.3	40	25	CMZ	Channel migration	3	W. Fk. Satsop; 33/20/7; 21687
SIG-Qc1	12.8	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 22/20/7; 23769
SIG-Qc2	8.9	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 13/20/7; 24502
SIG-Qc3	9.1	25/15	10	CMZ	Temperature sensitive	3	Unnamed; 22/20/7; 23132
SIG-Qo1	38.3	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	N. Fk. Abyss; 28/21/7; 27524
SIG-Qo2	19.0	3 ac/Mft.	20/10	CDZ	Unstable / Intermittent	4	Unnamed; 29/20/7; 22670
SIG-Qo3	4.8	25/15	10	BIS	Break in slope	2	Unnamed; 16/20/7; 42409
SIG-Qo4	2.0	30	20	BIS	Break in slope	2	Devils Club; 16/21/7; 29638
Total	**1397.8**						

[24] All widths are in meters; where two average widths are given, the wider applies to the windward aspect and the lesser to the leeward aspect, in cases where only one average width is provided, it applies to both sides of the stream. In the case of the Unstable/Intermittent Flow strategy some segments will be given discontinuous buffers consistent with Guideline 4, Table 27.
[25] Except when a stable terrace exists below inner gorge slope, then harvest permitted to break in slope.

Table 27. Riparian management guideline descriptions

Guideline	Description
1	No-harvest
2	No-harvest or subject to experimental management pursuant to Section 5.2.7.
3	No-harvest or subject to experimental management pursuant to Section 5.2.7.
4	**A.** Where fish[26] are present or perennial flow[27] exists a minimum of 3.0 acres of no-harvest leave area per 1,000 feet of channel beyond the channel disturbance zone will be retained. A 10 and 20 meter minimum width extending from the channel disturbance zone will be preserved on the leeward and the windward sides of the stream respectively. The balance of the leave area shall be organized to protect and develop a full range of riparian forest functions as they occur for specific channel classes and individual stream settings. It is anticipated that the leave acreage outside the minimum zones will be concentrated on the windward side, around tributary junctions, forested wetlands, side slope seeps, adjacent to reaches where discontinuous terraces may occur or develop, and in areas that may be especially prone to windthrow. Any unstable slopes that lie streamward of a 20 m average boundary on each side (from the CDZ) may be counted toward the 3.0 acre leave requirement but leave areas buffering unstable slopes outside that zone, are additive and guided by prescriptions in Section 5.2.4. **B.** Channel segments that support fish at any time of the year, but that are spatially or temporally intermittent or entirely dry shall be provided continuous buffer protection consistent with other provisions of this guideline 4. **C.** Unstable slopes adjacent to the channel will not be harvested and shall be afforded continuous no harvest protection. **D.** In the remaining segments not receiving continuous protection under conditions in **A** - **C** above, 80 trees per 1,000 feet of channel shall be retained (equal in size distribution and species characteristics to the pre-harvest stand). The leave trees shall be left in at least 0.5 acre patches (however credit will be given for isolated trees) that will be organized to provide functional requirements for specific channel classes. **E.** Where delivering unstable side slopes exist adjacent to channel segments that are upstream of segments assigned the 80 trees (0.5 acres) per 1,000 feet guideline and where such segments lie sequentially upstream from segments assigned continuous riparian protection, leave will be increased to 160 trees (1.0 acres) per 1,000 feet and will be left in a continuous buffer immediately adjacent to the channel.

[26] Fish are defined as <u>all fish</u> including sculpins and lamprey (see Table 1). Simpson will determine the presence or absence of fish with the use of electro-fishing gear (in accordance with guidelines of the WDFW and endorsed by the Services). While "habitat diagnostics" approaches are currently popular, Simpson has extensive experience with fish distribution and habitat characteristics in the Plan Area and knows that the habitat based approaches often understate or overstate the actual zone of fish use. Unless an abrupt and permanent change in physical characteristics occurs Simpson seldom documents the end of fish distribution as the last fish in its surveys because this point may move upstream or downstream over time, depending on small scale changes to habitat or inter-annual variation in flows. There is most often a tributary junction nearby in the upstream direction that makes a reasonable breaking point. Often these tributary confluence's represent points in the channel network where watershed area is reduced by such a significant amount (sometimes by half) that the channel characteristics change significantly. These changes usually render the channel incapable of supporting fish due to a shift to "colluvial" conditions. Simpson does its fish distribution surveys at times that optimize the opportunity of finding fish based on life history traits and seasonal movement patterns.

[27] Perennial flow is defined by a watercourse that has water within it at all times of the year. The existence of perennial flow may be determined by either the presence of water during the lowest flow period of the year, normally early fall, or the presence of aquatic organisms that require year round water to complete their life cycle.

Appendix C: Details of Road Inventory

General

Simpson will implement a comprehensive and systematic inventory of its entire road system as part of the HCP implementation (Section 5.2.2.1(b)). The purpose of this inventory is to identify problems with the road system that need to be corrected in order to prevent harm to public resources. These problems will be prioritized and scheduled for remedial work using information collected during the inventory. Data collected during this inventory will be organized and stored in a database associated with Simpson's GIS (Section 5.2.2.1(c)). For those problems that require follow-up actions or inspections, the inventory and the database will be used to establish schedules and produce automatic work orders for the road maintenance crews.

The inventory will be implemented on a priority basis for watersheds ranging in size from 2,000-10,000 acres. Watershed priorities will be established based on the value of aquatic resources potentially at risk. Highest priority will be accorded watersheds currently supporting large numbers of anadromous salmonids (e.g. Kennedy, Bingham, and Schafer Creeks). Simpson will establish these priorities in consultation with the SAT.

What follows is a brief description of the inventory procedure and the outputs from the database.

Road Inventory Procedure

The road inventory will be implemented at a small watershed scale (2,000-10,000 acres) in an order that will be based on their significance to anadromous salmonid production. The SAT will be consulted during the development of a priority list for implementation of the road inventory. The actual inventory process will consist of three primary stages; 1) office planning, 2) field inspection and data collection, and 3) data entry and report generation. All three work categories for individual road inventories will be the responsibility of the same individual.

Office Planning

In this stage of the inventory two primary tasks are to be completed; 1) a review of the historical performance of the road system, and 2) logistical planning. Sequential aerial photos will be reviewed to document past failures within the road system being inventoried. These sites will be transferred onto the maps that are assembled at this point for reference and special attention during the field inspection stage of the inventory work. A compilation of notes assembled during this phase will become a permanent part of the archived record for each road inventory.

Field Inspection and Data Collection

A visual inspection of the entire road system will be made. During these inspections, a data sheet will be filled out for each road segment (defined by road junctions) and each channel intersection that occurs in that segment (see accompanying example data sheets). Inspection work will be completed by Simpson personnel who have many years of experience identifying maintenance requirements for logging roads. During this inspection the road system will be evaluated for the likelihood of it's impacts to public resources by inspecting a complete range of structural features and assessing how they are functioning and interacting with natural landscape characteristics.

Field inspections are separated into two separate data categories; 1) the road (including the running surface, ditches, relief culverts, cutbanks and sidecast), and 2) channel crossings.

1. Evaluation of all road-related sediment delivery mechanisms.

All road segments will be evaluated for problems in the following areas:

a) Ditch erosion and incision.

b) Adequacy of road drainage features including road prism grading, relief culvert spacing, and relief culvert outfall location and treatment.

c) Stability and potential deliverability of sidecast material.

d) Cut slope stability and relationship to ditch function.

e) Interception of shallow subsurface flow.

f) Drainage piracy and transfer of water between catchments.

2. Evaluation of all channel and road intersections.

All channel and road intersections will be evaluated for problems in the following areas:

a) Fish passage at all culverts.

b) Flood flow capacity of the culvert.

c) Road surface sedimentation from approaches.

d) Likelihood of diversion at the culvert.

e) Likelihood of fill failure and approximate volume that could be lost.

f) Structural condition of culvert.

Road Segment Database

Road Inventory Data Entry and Report Generation

The data collected in the field (as described) will be entered into Simpson's Road Segment Database. Data will be stored in the database for roads as well as for all channel crossings. This information will then tie directly to our GIS system so that maps and other GIS overlays can be created.

The database and GIS system will be used to generate reports and maps showing, for example, an average road score per mile and an average score per crossing for each basin. Based on the sensitivity of each basin (biological and water quality needs), and the field data, reports will be generated to help prioritize maintenance work. For the highest priority basins, detailed work orders will be developed and entered into the database that will best address the causes of the problems in that area to reduce the risk of future sediment delivery. The database will also be used by the road crew to schedule work and to account for work completed. Annual compliance reports and maps will be created from this database and GIS system to show where and how much work was completed.

Database Outputs

1. Identification of road segment status.

The plan area has roads of different ages and construction standards, many of which were built without a comprehensive view of long term logging or maintenance plans. Consequently there has not been any systematic evaluation of the need for many miles of existing road, much of which is currently in an inactive haul status. All road segments will be assigned an activity status in the inventory causing Simpson to determine if roads are needed for long term forestry operations. This action will place many road segments into a category for candidate decommissioning. Roads deemed non-essential for long term forestry operations will be candidates for decommissioning or dormancy conditioning.

2. Identification of problems associated with specific road segments and channel crossings.

3. Prioritized work orders for the maintenance crews.

4. Tracking system for recurrent inspection and maintenance requirements.

DRAFT Road/Stream Crossing Inventory/Maintanence Data Sheet

Road #: ____________ ***Road_Point_ID #:*** ______________ **Road_Pnt_Mslink #:** ________

Date Inv: ___________ **Inspector:** ____________________

Comments: ____
____

Work Orders: ____
____

Re-inspection Schedule: Annual 2 years 5 years 10 years

Crossing Type: Bridge Culvert

Bridges:

Year Installed: _____________

	Problem:	Ranking:	Comments:
Inadequate High Flow Protection?	Yes / No	_____	
Direct Delivery from Approach?	Yes / No	_____	
Direct Delivery from Ditchline?	Yes / No	_____	

Total Bridge Ranking Score: _______/9

Culverts:

	Problem:	Ranking:	Comments:
Functional/Flow problems?	Yes / No	_____	
Inadequate High Flow Protection?	Yes / No	_____	
Direct Delivery from Approach?	Yes / No	_____	
Direct Delivery from Ditchline?	Yes / No	_____	
Filled in catch basins?	Yes / No	_____	
Fish Blockage?	Yes / No	_____	
Failure Risk?	Yes / No	_____	
Estimated fill volume (cubic yards) _____			

Total Culvert Ranking Score: _______/21

Priority Ranking Scoring:
3 - High Priority
2 - Medium Priority
1 - Low Priority
0 - No Mitigation Needed

DRAFT Road Segment Inventory/Maintanence Data Sheet

Road #: ____________ ***Road_Inv_ID #:*** ______________ Segment #'s: ________
____
____
____

Date Inv: ___________ Inspector: _______________

Comments: ____
____

Work Orders: ____
____
____
____

Road_Type: Mainline Branch Spur Railroad Other

Current Road Activity Status: Active Inactive Blocked Orphaned Deactivated

Future Road Use Category: Permanent Dormant Decommission

Re-inspection Schedule: Annual 2 years 5 years 10 years

		Problem:	Ranking:	Comments:
Cut Slope	Excessive Raveling/Eroding?	Yes / No	_____	
Ditches	Excesive Ditch Erosion?	Yes / No	_____	
Surfacing	Eroding and delivering?	Yes / No	_____	
Cross-Drains	Inadequet Size/Spacing?	Yes / No	_____	
	Needs Energy Dissipators?	Yes / No	_____	
	Filled in catch basins?	Yes / No	_____	
Sidecast	Unstable/cracking?	Yes / No	_____	
	Excessive Ravelling/Eroding?	Yes / No	_____	
Brush	Is brush control needed?	Yes / No		

Total Ranking Score: _______/18

Priority Ranking Scoring:
3 - High Priority
2 - Medium Priority
1 - Low Priority
0 - No Mitigation Needed

Definitions – Road Terms

Road Types (to be mapped in GIS roadcl.dgn layer):

Mainline: Forest road that is of highest standard and has high traffic levels, used frequently for hauling forest products, usually road # ends with 00. These roads will be part of our permanent road system.

Branch: System road connecting spurs to mainline, used for multiple units over time, not as much traffic compared to mainlines, usually road # ends in 10's or 5's. These roads may be a part of our permanent road system.

Spur: Short, lower standard forest road used for a particular forest practice. Needed for logging, planting, and continuing management of unit, but traffic levels are lower still than branch roads. These roads may be deactivated after use.

Current Road Activity Status:

Active Roads: Forest roads actively used for hauling forest products (wood, rock, etc). Must maintain culverts and ditches, minimize erosion of road surface, and crown, outslope or waterbar.

Inactive Roads: Forest roads where hauling has been discontinued for 1 or more seasons. Must clear culverts and ditches before 1st rainy season and crown, outslope or waterbar. Then landowner is not liable for penalties.

Blocked: Roads that have been tank-trapped or otherwise blocked to vehicle access, but with little or no deactivation work done.

Orphaned: Old forest roads that are inactive and haven't been used for years. These roads may or may not be driveable.

Deactivated: 2 classes of deactivated roads: decommissioned and dormant. (see definitions below)

Future Road Use Categories:

Permanent Roads: forest roads needed permanently for long-term forest management.

Dormant Roads: Roads put into a dormant category such that the chances of erosion and failure are virtually eliminated. Examples of dormancy work include blocking vehicle access, pulling back unstable sidecast near stream crossings, clearing ditches, culverts opened or culvert and fill removed, road surface outsloped or crowned, cross ditches or other drainage structures added.

Decommissioned Roads: Roads to be decommissioned such that hill slope function and drainage patterns will be returned to a natural state and the road prism will be virtually eliminated and revegetated. Examples of decommissioning work include blocking access, pulling back sidecast, outslope and obliterate road prism, fills at all crossings removed and culverts or bridges pulled, cross ditches or other drainage structures added, and exposed surfaces revegetated.

Road Maintenance:

Operational: Continuing work done on active roads to keep them up to standards during use, including grading, crowning, ditch clean out, etc.

Emergency: Emergency work done to repair recently created major problems (slides, etc.), that is done rapidly to keep roads open. A post event analysis will be done to identify factors involved in causing the damage and to determine if other additional steps need to be taken to prevent such future occurrences.

Preventative (Inventory): Future road maintenance and deactivation work done in compliance with HCP that will be determined from field inventory and prioritization work.

Drainage Structures:

Cross Drain: Culvert to relieve runoff from ditches, not associated with stream crossings.

Cross Ditch: Deep depression cut across road to move water from ditch and running surface away from road and onto forest floor to reduce erosion from increased volume and velocity of water. For use only on deactivated roads, otherwise it would be a driveable dip.

Driveable Dip: Depression cut across road surface to move water from ditch and running surface away from road and onto forest floor to reduce erosion from increased volume and velocity of water. For use on permanent and temporary roads.

Water bar: Small depression cut across road tread to move water off of running surface and into ditch line or onto forest floor to reduce erosion from increased volume and velocity of water.

Appendix D: Small Stream Assessment

General

The subject of small stream management has come under increasing scrutiny in the forested landscape. In part this is because small stream management involves more uncertainties and less information than are generally available for assessments and prescriptions involving larger streams. Simpson believes that this HCP represents a significant attempt to characterize and manage small streams in the context of a highly variable landscape. The approach Simpson is proposing should be credited for two things: (1) a significant advance in the level of protection currently afforded the small stream base on private forest lands, and (2) a well designed experiment in small stream management in which the risks to the public resources have been minimized by a careful assessment and classification of headwater channels.

Small stream base

The group of channel classes assigned to the Intermittent Flow / Unstable Slopes ("IFUS") riparian strategy is the most diverse and difficult to characterize of any that is associated with one of the plan's riparian strategies. The current regulatory scheme for forest practices in Washington lumps most of these channel types together as Type 4 or 5 or under the new proposed scheme, non-fish bearing. Of the 919 miles in this group, 775 miles or 88 percent are classed as 4, 5, or 9. However, virtually all 14 channel classes have some segments that support fish or maintain perennial flow (Table 28).

Table 28. Miles of channel classes assigned the IFUS strategy by DNR stream type.

Channel Class	Class Character	Class Miles	DNR Stream Type (miles)					
			1	2	3	4	5	9
AGL-Qo1	Sm, HC, SP_f/SP	**61.4**	0.0	0.5	10.5	7.6	26.1	16.7
AGL-Qo2	Sm, MC-UC, PR_f	**22.5**	0.0	0.0	7.9	3.5	3.7	7.4
CIS-C1	Sm, HC, SP_f	**84.0**	0.0	0.0	4.7	3.0	24.4	51.9
CIS-Qc1	Sm, HC, SP_f	**33.3**	0.0	0.0	1.1	1.5	8.8	22.0
CIS-Qc2	Sm, MC-UC, PR_f	**28.1**	0.4	0.1	8.5	3.1	4.4	11.6
CUP-C1	Sm, HC, Cas/BD	**199.6**	0.0	0.0	1.7	55.6	74.1	68.4
ROP-Qc1	Sm, UC, PR_f	**165.7**	0.0	2.4	33.9	32.4	36.7	60.3
SIG-L1	Sm, HC, SP_f	**160.0**	0.0	0.0	8.1	6.5	57.7	87.7
SIG-M1	Sm, HC, SP_f	**67.8**	0.0	0.0	3.9	4.8	33.3	25.8
SIG-M2	Sm, MC, PR_f	**18.5**	0.0	0.0	7.7	4.9	4.1	1.8
SIG-Qc1	Sm, HC, SP_f	**12.8**	0.0	0.0	1.7	2.4	6.6	2.1
SIG-Qc2	Sm, MC-UC, PR_f	**8.9**	0.0	0.0	3.2	0.4	3.3	2.0
SIG-Qo1	Sm, HC, SP_f/SP	**37.7**	0.0	0.0	2.6	5.7	16.7	12.7
SIG-Qo2	Sm, MC-UC, PR_f	**18.9**	0.0	0.0	10.3	4.4	2.9	1.4
Totals		**919.2**	0.5	3.0	105.6	135.7	302.6	371.8

Management approach

Consistent with Simpson's overall riparian approach, it is the goal of the IFUS riparian strategy to maintain important functional linkages between channel segments and their riparian forests. Even though channel classes assigned this strategy typically have low on site fish resource value, in some instances significant impacts may be transmitted downstream to other channel segments of the same class or those of other classes for which on site fish resource value is higher. Certain of these channel classes also support stream breeding amphibian populations and their habitat. In order to optimize both environmental protection and timber harvest opportunity, Simpson’s HCP emphasizes a flexible approach to managing the diversity of ecological function and wide range of physical settings in this group of channel classes. Simpson’s assessment of the differences between and within classes, and its classification system that organizes those differences, provides the necessary scientific framework for the application of management prescriptions.

Reiteration of general management prescriptions

Appendix B contains specific information on the application of the IFUS riparian strategy. However, a simple reiteration may be helpful here for the sake of continuity and readability of this section. For channel segments where any species of fish are present or where perennial flow is maintained, a minimum of 3 acres of no harvest continuous buffer per 1,000 feet of channel will be retained in a pattern that optimizes functional benefits for the channel class. Unstable slopes adjacent to any of these channel classes will also be protected with continuous leave areas regardless of the presence or absence of fish or perennial flow. In many cases the unstable leave areas will significantly increase the number of trees retained adjacent to these channel classes. Where fish are not present at any time during the year or where perennial flow is not supported, and no instability exists, 80 trees per 1,000 feet of stream shall be retained that are representative of the pre-harvest stand in both size and species composition. In most cases, leave trees will be left in patches of at least ½ acre in size and strategically located where they will have a high likelihood of contributing to the functional requirements and ecological roles of the particular channel segments. Such places may include tributary junctions, areas of locally steeper channel slope, areas of locally greater valley width, or adjacent to seeps and springs. The clumping of leave trees along non fish-bearing portions of these channel classes will provide discontinuous forest fragments for recruitment of LWD, maintenance of bank stability, inputs of detrital material and terrestrial refugia for certain riparian associated amphibians. In those cases where unstable slopes exist upstream from channel segments that would be protected with discontinuous buffers, a continuous buffer of 160 trees per 1,000 feet of channel will be retained in a continuous band adjacent to the channel to provide increased buffering for potential debris flow runout.

Risk assessment

Three critical areas are addressed below to assist reviewers in evaluating the relative level of risk associated with Simpson’s IFUS strategy: (1) the extent of the small stream base available for immediate harvest under these prescriptions, (2) relative physical hazards, and (3) biological resources supported in each of the different channel classes comprising the group. Taken together this information provides a solid basis for evaluating the sufficiency of the overall approach to protecting riparian function and aquatic habitat and the relative level of risk associated with this aspect of the HCP.

Extent of small stream base in harvestable age stands

Table 29 lists the mileage for each channel class that has been harvested to a particular “industry period standard”. The last column represents the mileage base that could be harvested immediately under the HCP prescriptions (i.e. harvestable age second growth timber). These numbers may provide a useful index to the current “conservation opportunity” for each channel class. Based on Simpson’s log sourcing strategies and projected rotation ages, thirty-seven percent of the channel mileage base assigned to the IFUS strategy is available for harvest today, the rest being in some stage of re-growth following a previous harvest.

Extent of small stream base receiving protection

Under the plan proposal 100 percent of the channel mileage will receive protection of some kind, be it continuous buffering for fish, perennial flow or unstable slopes, or discontinuous buffering in the absence of these factors. While no figure for the mileage afforded continuous protection by unstable slopes is available for these channel classes, it is anticipated that the additional protection for unstable slopes required by the plan will substantially augment the continuous buffers provided for channel segments supporting fish or that maintain perennial flow.

Table 29. Estimate of the number of miles harvested to "industry period standards" for each channel class in the IFUS riparian strategy.

Channel Class	Miles in Class	Pre-FPA	FPA-TFW	TFW-Present	Available
AGL-Qo1	61.4	11.1	2.6	12.0	35.7
AGL-Qo2	22.5	4.1	0.9	4.4	13.1
CIS-C1	84.0	6.7	23.4	28.6	25.2
CIS-Qc1	33.3	2.7	9.3	11.3	10.0
CIS-Qc2	28.1	2.2	7.8	9.6	8.4
CUP-C1	199.6	87.0	11.8	26.6	74.3
ROP-Qc1	165.7	13.9	26.8	62.8	62.0
SIG-L1	160.0	13.9	36.3	52.8	56.8
SIG-M1	67.8	5.9	15.4	22.4	24.1
SIG-M2	18.5	1.6	4.2	6.1	6.6
SIG-Qc1	12.8	1.1	2.9	4.2	4.5
SIG-Qc2	8.9	0.8	2.0	2.9	3.2
SIG-Qo1	37.7	3.3	8.6	12.4	13.4
SIG-Qo2	18.9	1.6	4.3	6.2	6.7
Total	**919.2**	**156.0**	**156.4**	**262.3**	**343.8**

Physical hazards and biological resources

AGL-Qo1

This channel class occurs at the tip of the channel network in the AGL and runs through glacial tills that are highly cemented and capable of holding steep slopes with little risk of failure. In some cases however, subsurface moisture accumulates and comes to the surface on the over-steepened lower slopes of these low order valleys indicating a combination of factors that constitute unstable conditions. Large logs or accumulations of logs from past shallow rapid landslides or logging debris serve to locally stabilize the entire valley floor, which is often no more than 5 meters in width. Owing to this relatively narrow valley, sediment derived from mass wasting of the side slopes is generally deliverable. Shallow rooting of Douglas fir in these soils and the preponderance of Western hemlock in these stands makes AGL-Qo1 riparian settings prone to wind damage unless they are topographically sheltered. Woody debris helps to retain sediment and moderate local channel slope in these systems but channel roughness also is supplied by large glacial clasts in the channel bed.

Simpson has recorded relatively high densities of tailed frog and Cope's giant salamanders in those segments draining the western watershed between the West Fork Satsop and the Wynoochee Rivers. Incidental observations in this channel class west of the Wynoochee also suggest high value to stream breeding amphibians, particularly Cope's giant salamander. It appears to be the coarse stream bed and relatively moist conditions of the watersheds that favor stream breeding amphibians in this channel class. In the discontinuous protection reaches, trees will be left adjacent to seeps, which occur with some regularity in the glacial soils.

AGL-Qo2

AGL-Qo2 segments connect the upper portions of the channel network in the AGL to the larger channel segments that support anadromous fish. As sediment sources, they are generally low risk segments due to the more "relaxed" valley topography and channel slopes. The broader valleys (10-30 meters) provide depositional zones for the occasional debris flow that may originate in an AGL-Qo1 tributary or an adjacent over-steepened valley wall resulting in a low risk for transmitting sediment downstream. AGL-Qo2 valleys are floored by wet soils and due to the previous harvest history and natural plant potential are currently supporting early to mid-successional stands dominated by red alder. These sites ultimately have the potential to support Western hemlock stands interspersed with Western redcedar but may frequently cycle through a seral wet shrub community mosaic due to periodic wind disturbances and delayed conifer succession. These systems have limited capacity to transport and rearrange woody debris and even relatively small diameter logs can make a contribution to habitat complexity.

Lying as they do between the non-fish bearing portion of the network and the principal fish producing segments, these segments can be important for sustaining resident fish species and amphibians. Protection will come predominately as continuous buffers for fish and management efforts will focus on the identification of fish bearing and perennial segments of this class for continuous protection. Relatively few segments in this class do not support fish - commonly cutthroat trout and riffle sculpin.

CIS-C1

Channel segments originating on the basalt islands in the CIS comprise this class (see Section 2). These channels are steep (up to 30 percent) and have a coarse substrate of angular basalt. However, channels are not deeply incised and the valley side slopes are stable, posing a low sediment source risk (channel class verification work in approximately 15 segments has recorded very few recent side slope failures). Soils in these glacially over-ridden landscapes are thin and with a few notable exceptions, water storage is poor. Consequently basins as large as 100-120 acres are commonly dry during the summer. This flow regime tends to make them marginal habitat for stream breeding amphibians. Simpson has documented a few exceptions to this general case and in these circumstances the habitat appears to be suitable for Cope's giant salamanders, tailed frog and cutthroat trout. Simpson has identified two such segments that contain tailed frog and several others that support resident trout and sculpins. Management of this class will focus on opportunities such as these and will require careful inventory so that the exceptional cases are not overlooked.

CIS-Qc1

The CIS-Qc1 channel class connects the CIS-C1 segments to larger channels of the CIS, either CIS-Qc2 or 3. These segments begin at the boundary of the basalt and the glacial drift that blankets the shoulders of the basalt islands. These segments are also generally viewed as relatively low risk for sediment principally due to limited fluvial transport capacity and the lack of significant mass wasting. Springs and seeps, however, do occur on the side slopes of these channels and these areas will be protected. Woody debris functions to form steps in these systems and stabilizes valley walls and local channel bed. The road system in the CIS can intercept and redirect shallow groundwater in these settings. Avoiding this interception and piracy will be an important conservation issue for this channel class.

CIS-Qc2

This channel class is not a high risk for sediment sources, which mainly come from erosion of the stream banks. There are no significant mass wasting issues and where they do occur, the probability of delivery is low due to the relatively wide valleys they typically occupy. Woody debris is important to structure the habitat in these systems and riparian trees also stabilize stream banks. Recent surveys by Simpson indicate that virtually all of the segments in this channel class will require continuous riparian protection for fish or perennial flow.

CUP-C1

The CUP-C1 channels are significant for several reasons. First there are many miles in this class. Secondly, they are the primary conduits for debris flows in the CUP and as such represent high risks for sediment delivery to larger order channel segments. Debris flows transmitting through these channel segments can, in some cases multiply what may have started as a small quantity many times over before it runs out in larger connecting channel segments. The sediment they deliver to the main canyon systems is routed downstream efficiently where it is deposited in alluvial fan segments at the mouths of the canyons. These downstream segments are important fish habitat for both resident and anadromous species. Thirdly, although on-site biological value for this channel class is quite variable, where they are perennial or even intermittent these segments have high value for stream breeding amphibians including torrent salamanders. Specifically torrent salamanders tend to be found in segments that exceed 30 percent slope in basins of less than 15 hectares. Protection in these segments will focus on slope instability and the identification of the high quality amphibian habitat. Simpson estimates that much of this class will receive continuous protection due to unstable slopes or perennial flow. The road maintenance program, especially the decommissioning option, will be a significant conservation measure for this channel class.

ROP-Qc1

The ROP-Qc1 class represents a varied group of segments that occur on the flat up-slope of the ROP and total 165.7 miles. These segments are comprised of slightly incised and or confined channels that principally function as linkages between wetlands or between the larger streams and wetlands. Due to the impermeable character of the glacial tills in this area, the ROP landscape tends to store water poorly, creating a flashy runoff pattern in an otherwise low energy stream environment. These same compacted soil horizons cause shallow root systems in Douglas fir (the dominant conifer species in these stands) which make them especially vulnerable to windthrow. Woody debris is not particularly important in the habitat development of this channel class, however, logs frequently are responsible for creating the only pools that maintain water during dry summers. Low gradient and plentiful water seasonally encourages relatively deep penetration of these systems by a variety of fish species including coho, cutthroat, sculpin, and dace. These systems pose virtually no risk from a sediment perspective, the primary source in the area being ditch line and road surface erosion. Amphibian resources are only of the most common variety including northwestern and western red back salamanders, rough skinned newts, and chorus and red-legged frogs. All of these species are primarily breed in wetlands.

ROP-Qc2

The ROP-Qc2 channel class is provided a Break in Slope riparian strategy but since segments in this channel class are relatively small and there is considerable within Plan Area variability, a description is given here. This class has two distinct members; one in the northern portion of the ROP in the Skokomish River basin and another in the southern portion of the ROP in the Stillwater River basin. The northern member represents a significantly greater risk for physical hazards but is less important biologically with numerous segments seasonally dry and incapable of supporting fish and amphibians. These segments however, have long steep side slopes (10-90 meters long and 70-90 percent slope) and it is relatively common to see side slope failures (0.80 failures per 100 meters) which can generate modest to large amounts of coarse glacial gravels and deposit them directly into small channels. Such channels have a very porous bed and are dry in the summer.

The southern members are connecting segments from the larger ROP-Qc series to wetlands or to connecting Qc-1 segments. These segments have much shorter side slopes, but are often in excess of 70 percent and many fewer failures (average 0.23 per 100 meters). Those failures that do occur are minor in nature contributing little sediment to the system. Many of the southern members however, are fish bearing and provide linkages to wetland over wintering habitats. Many of the windthrown trees adjacent to this channel class bridge the channel and there is not a significant functional contribution until the gorge width at the valley top reaches approximately 40 meters.

SIG-L1

The SIG-L1 channel class is one of the more inherently unstable channel classes. Physical surveys have recorded steep side slopes (nearly half of the length surveyed had side slopes in excess of 70 percent) with failure rates averaging 1.76 per 100 meters, the highest of any of the small channel classes. These failures appear largely unrelated to management as they occur with some regularity in forested, buffered, and clearcut settings. A few important exceptions to this observation appear to be related to the piracy of water by the road ditch system. Siltstones of the Lincoln formation are highly weathered and erodible and woody debris appears to play a role in the stabilization of the channel bed and valley side slopes. The long term role of wood in structuring the channel bed and preventing channel incision, to the degree that it could destabilize side slopes, could be significant. Biological resources on site are minimal. Simpson’s assessments indicate that Cope’s giant salamander and crayfish are the most common aquatic resources. Western red back and northwestern salamanders, rough skinned newts, and red-legged frogs are found in riparian areas. The SIG-L1 segments frequently connect downstream to the SIG-L2 segments, which can harbor isolated populations of riffle sculpin. Unstable slopes and perennial flow will result in significant protection for the L1 series. Discontinuous protection will be focused on tributary junctions and areas of steeper than average side slopes. The purpose of leaving patches of timber in these two places respectively, is to provide woody debris for stabilization of areas that can serve as sediment sinks, and to protect the best (for this class) stream breeding amphibian habitat.

SIG-M1

Small first and second order channels in the Montesano sandstone series are classed as SIG-M1 segments. Side slopes in this landscape range widely between 30 and 90 percent; the upper bound being somewhat uncommon. These segments can be high slope stability risks, especially if peak storm flow is augmented through piracy of water by the road ditch system. Side slope failure rates observed averaged 0.36 per 100 meters. Failures tended to exhibit a very shallow failure plane about 20-30 cm deep. The failure “rind” is the shallow soil that overlies the sandstone bedrock, which occurs as a massive formation. Simpson currently has not done any biological assessments in this channel class but based on the unconsolidated character of the channel substrates, limited value is expected for stream breeding amphibians. However, the M-1 members usually connect to M-2 segments, which are frequently fish-bearing. Often the valley opens up and is quite wide at the confluence area between M1 and M2 segments. Given appropriate wood loading, this junction area functions as a sediment sink that largely disconnects the upper and lower basin coarse sediment budgets. Protection of this class will focus on steep sided M1 segments and the confluence areas between M1 and M2 segments.

SIG-M2

M2 segments occupy valleys in the Montesano sandstone formation that are from 8-20 meters wide. These valley bottoms are wet and the channel segments typically maintain perennial flow often having small populations of cutthroat, coho, and sculpin. Observed side slopes are less than 70 percent and mass wasting delivery potential is small due to the relatively wide valleys. Sediment in these systems is derived from bank and terrace erosion. Woody debris functions to stabilize the valley bottom, much of it well buried in the valley sediments. However, the current riparian forest is largely hardwood with a few large residual conifer. This channel class may be a good candidate for active riparian management such as under planting of shade tolerant species.

SIG-Qc1

SIG-Qc1 segments occur as a headwater channels in rolling glacial topography between the Middle Fork and the West Fork Satsop Rivers. As such it is a minor class in our scheme with 12.8 miles total recorded in Simpson’s GIS. Simpson is currently conducting channel class verifications for this class and the few fish and amphibian surveys that have been conducted indicate minor value for stream breeding amphibians with some cases of riffle sculpin in isolation, and a few segments with resident cutthroat trout and brook lamprey. Some locally steep side slopes may pose infrequently occurring physical hazards for mass wasting.

SIG-Qc2

The SIG-Qc2 channel class occurs in the same general region of the Plan Area as the SIG-Qc1 segments. These segments area low gradient and often include an open water wetland somewhere within their length. They frequently have cutthroat trout or sculpins and sometimes dace and brook lamprey. But the distribution of any of these species is somewhat discontinuous within this highly variable channel class. These segments will convey little if any coarse sediment to downstream segments due to the contiguous wetlands which interrupt sediment routing within their basins.

SIG-Qo1

SIG-Qo1 segments are at the tip of the channel network along the western divide between the AGL and the SIG. Segments of this class are physically very similar to some AGL-Qo1 segments. The highest tailed frog densities recorded in Simpson’s stream breeding amphibian surveys occur in segments of this class. Side slopes are variable between 40 and 70 percent. Channel widths vary from 1-4 meters with valley widths of 6-18 meters. The highly incised escarpment members of this class have a side slope failure rate averaging 0.31 failures per 100 meters. However, for the class as a whole the failure rate averages only 0.08 per 100 meters which reflects the more stable nature of the terrain of the upland members of the class. Management of this class will focus on unstable leave areas in the steeper members of the class and protection of high quality tailed frog habitat and segments with perennial flow.

SIG-Qo2

The SIG-Qo2 channel class connects the tips of the channel network with the main incised inner gorge systems of the SIG, principally the SIG-L4 segments. Valley topography is generally quite relaxed with a valley width of 20 meters or more. Channels slopes range from 2-5 percent with a channel bed composed of glacial gravels and cobbles. Most of the riparian areas are very wet today and are dominated by red alder with some cottonwood and miscellaneous hardwood species. Evidence of a conifer forest with large specimen cedar and occasional Douglas fir on higher better drained sites exists. The principal biological resource is riffle sculpin, which are isolated above waterfalls ranging up to 10 meters and more in height. Much of the class will receive continuous protection based on the presence of sculpin and perennial flow.

Appendix E: Riparian Monitoring Studies

General

The following is a brief synopsis of a riparian monitoring project that Simpson conducted in 1996 and will expand under provisions of Section 9 of this HCP. This information is presented in the HCP as one type of documentation for certain aspects of riparian forest baseline conditions.

Study Description

Thirty sites, well distributed across Simpson's ownership, were selected for monitoring (Table 31). Selection criteria required that both sides of the stream had been harvested (except for the riparian leave area) in the past 2-8 years according to DNR guidelines. All sites were adjacent to small to medium size fish bearing streams. The purpose of the project was to document the stand characteristics left after harvest and record the condition of the riparian forest after several years of exposure to the clear-cut edges.

Methods

One-hundred meter total sample reaches were marked on the ground with rebar and iron fence post monuments on each corner at each site. A GPS position was recorded for the downstream right bank corner and is stored in Simpson's GIS. The following site and tree level data were collected to characterize each riparian setting and each tree on the site:
Site: LTU; legal description; segment number; channel bed morphology; valley cross sectional; channel width; channel slope; distance to tree height elevation.
Tree: Species; DBH; status, (includes standing live, standing stressed, standing dead or down); surface location; moisture class (based on understory vegetation); For all downed trees: azimuth of fall; cause of fall; in channel or not; distance to channel; distance to clearcut edge; channel interaction. All trees 10 cm DBH or larger were recorded. Traverses of all sites were recorded to calculate the total forested acreage and to provide a method of reestablishing the monitoring boundaries in the future.

Results

4,528 stems (2,005 conifer and 2,523 hardwood) were measured in a combined area of 25.45 acres for the 30 sites. Species composition, the number of trees and basal area per acre between sites were highly variable (Table 32, Figure 14). The numbers in Table 32 are independent of the status of the stem and as such generally represent the stand as it existed at the time of harvest. Perhaps the most interesting result of this study is how riparian stand conditions are changing with time after harvest. There is a substantial mortality due to windthrow and stress presumably as a result in micro-climate change and exposure to the exposed clearcut edge (Figure 15). The directional signal for wind thrown trees is especially strong for conifer (Figure 16) and has significant implications for riparian guidelines (Figure 17). The edge trees in riparian buffers suffer substantial damage but some damage is spread throughout the entire buffer (Figure 18 and Figure 19). These combined results suggest that wider riparian reserves (widths observed in this study were all measured from the "ordinary high water mark") will better support riparian forest function but that the windward side is especially important to consider in wind sensitive settings. The results also suggest that a highly diverse riparian forest is developing that will have many beneficial components for both aquatic and terrestrial species. However, due to some of the disturbance effects of the clear cut edges, the trajectory for improvement for riparian systems on managed forest lands may be somewhat flatter than simple models predict. Snags, for example, are being recruited through natural processes (Table 30) but this mortality removes other functions such as shade that those trees were providing previous to harvest.

Table 30. Conifer snag density in riparian monitoring sites (number per acre). *Seventy percent of all snags were hard with 80 percent of the soft snags occurring in the small category. This is currently the best information existing on snag density for the RCR.*

Species	***10-30 cm***	***30-60 cm***	***> 60 cm***
Douglas Fir	4.44	0.86	1.02
Western Red Cedar	0.08	0.00	0.00
Sitka Spruce	0.04	0.04	0.00
Western Hemlock	1.14	0.16	0.12
Total conifer	**5.70**	**1.06**	**1.14**
Grand total	**7.90**		

Table 31. Permanent riparian monitoring sites maintained by Simpson.

Stream	**GIS Segment No.**	**LTU**	**Location (Sec, T, R)**
Gosnell Ck. trib.	17965	CIS	SE1/4,NW1/4; 15; 19/4
Gosnell Ck. trib.	19054	CIS	SE1/4,NW1/4; 12; 19/4
Beaver Ck.	20489	ROP	SE1/4,SE/14; 36; 20/6
Overlook Ck.	20577	ROP	SW1/4,NE1/4; 1; 19/6
Dry Bed Ck.	20789	ROP	NE1/4,SW1/4; 3; 20/6
Outlet Ck. lower	21084	ROP	SW1/4,SW1/4; 36; 20/6
Outlet Ck.	21085	ROP	NE1/4, NE1/4; 36; 20/6
Outlet Ck upper.	21087	ROP	NE1/4,NW1/4; 19; 20/5
Bingham lower	21088	ROP	SW1/4,NW1/4; 36; 20/6
Stillwater trib.	21887	ROP	NW1/4,NE1/4; 32; 20/5
Carter Ck. trib.	22011	AGL	SE1/4,NE1/4; 31; 20/7
Black Ck. trib.	23563	SIG	NE1/4,SW1/4; 20; 20/7
Likes Ck.	24231	ROP	SW1/4,NW1/4; 15; 20/4
Schafer trib.	24639	AGL	NE1/4,SE1/4; 13; 20/8
Replinger Ck.	24875	SIG	NE1/4,SW1/4; 10; 20/7
Wynoochee trib.	24979	AGL	NE1/4,NE1/4; 14; 20/8
Sandstone Ck. trib	25575	SIG	SE1/4,NE1/4; 8;20/7
Sandstone Ck.	25687	SIG	NW1/4,NW1/4; 9; 20/7
Bingham Upper	26164	ROP	NE1/4,SW1/4; 31; 21/5
Sandstone Ck. trib	26573	SIG	SW1/4, SW1/4; 33; 21/7
Stouder Ck.	26719	SIG	SE1/4,SE1/4; 33; 21/7
Cermak Ck.	26821	SIG	NW1/4,SE1/4; 35; 21/7
Bingham trib.	26918	ROP	NW1/4,NE1/4; 31; 21/5
Wildcat Ck.	27439	SIG	SE1/4,SE1/4; 25; 21/7
Rabbit Ck.	27823	ROP	SW1/4,SE1/4; 21; 21/6
Bingham trib.	27933	ROP	SW1/4,SE1/4; 21; 21/5
North Mt. Ck	28412	ROP	SE1/4,NE1/4; 20; 21/5
Devils Club Ck.	30161	SIG	NW1/4,NE1/4; 16; 21/7
Save Ck.	30620	AGL	NW1/4,NE1/4; 18; 21/7
Frigid Ck.	35525	ROP	N1/2,NE1/4; 23; 22/5

Table 32. Stand characteristics of riparian monitoring sites maintained by Simpson.

GIS Segment No.	Stream	Trees per Acre			Basal Area		
		Con.	Hdwd.	Total	Con.	Hdwd.	Total
26821	Cermak Creek	11.6	215.2	226.9	72.6	96.5	169.0
26719	Stouder Creek	16.3	164.1	180.3	53.6	139.8	193.4
20577	Overlook Creek	17.5	133.8	151.3	174.8	32.6	207.4
17965	Gosnell Creek trib	19.8	129.1	148.9	37.9	112.2	150.1
26164	Upper Bingham	29.1	133.8	162.9	54.0	149.7	203.7
20789	Dry Bed Creek	31.4	80.3	111.7	173.4	12.2	185.6
21087	Upper Outlet	32.6	136.1	168.7	160.5	2.9	163.4
26573	Sandstone Creek trib	32.6	167.5	200.1	27.6	105.3	132.8
20489	Beaver Creek	37.2	26.8	64.0	216.4	98.4	314.8
30620	Save Creek	62.8	192.0	254.8	282.8	5.3	288.1
24231	Likes Creek	65.2	15.1	80.3	92.7	88.8	181.5
24639	Schafer Creek trib	71.0	60.5	131.5	132.0	81.4	213.4
27933	Bingham Creek trib north	72.1	94.2	166.4	174.8	21.6	196.4
21887	Stillwater River trib	73.3	7.0	80.3	158.9	65.7	224.6
19054	Gosnell Creek trib	74.5	111.7	186.2	176.3	25.8	202.2
27823	Rabbit Creek	78.0	112.9	190.8	166.3	11.1	177.4
24875	Replinger Creek	80.3	24.4	104.7	179.1	84.6	263.7
24979	Wynoochee River trib	80.3	30.3	110.5	92.0	105.0	197.0
25687	Sandstone Creek	83.8	128.0	211.8	51.5	158.5	210.0
23563	Black Creek trib	86.1	116.3	202.4	46.3	112.2	158.4
21085	Middle Outlet	88.4	17.5	105.9	39.5	118.1	157.7
21088	Bingham Creek	96.6	96.6	193.1	28.5	149.3	177.7
28412	North Mountain Creek	100.1	47.7	147.8	175.2	35.5	210.7
22011	Carter Creek trib	112.9	116.3	229.2	153.0	86.2	239.2
25575	Sandstone Creek Upper	126.8	150.1	276.9	93.4	93.1	186.5
21084	Lower Outlet	131.5	24.4	155.9	67.5	112.7	180.3
27439	Wildcat Creek	132.6	87.3	219.9	272.9	60.7	333.5
35525	Frigid Creek	147.8	57.0	204.8	121.0	86.4	206.9
26918	Bingham Creek trib south	158.2	36.1	194.3	84.5	98.7	183.2
30161	Devils Club Creek	182.7	223.4	406.1	159.8	25.2	185.0
Average		**77.8**	**97.8**	**175.6**	**124.0**	**79.2**	**203.1**

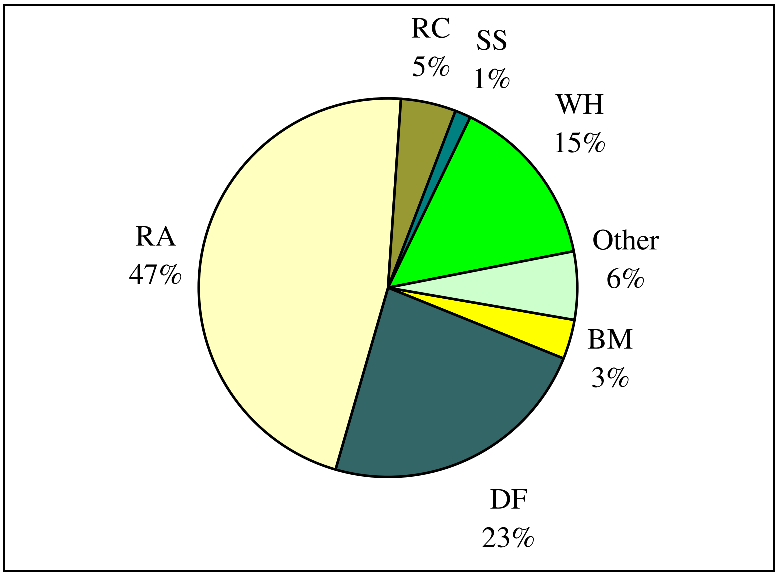

Figure 14. Species composition for the combined sample of all stems for the 30 riparian monitoring sites maintained by Simpson (N=4,528).
DF= douglas fir, RC= western redcedar, WH= western hemlock, SS= sitka spruce, BM= big leaf maple, RA= red alder, other is incidental species.

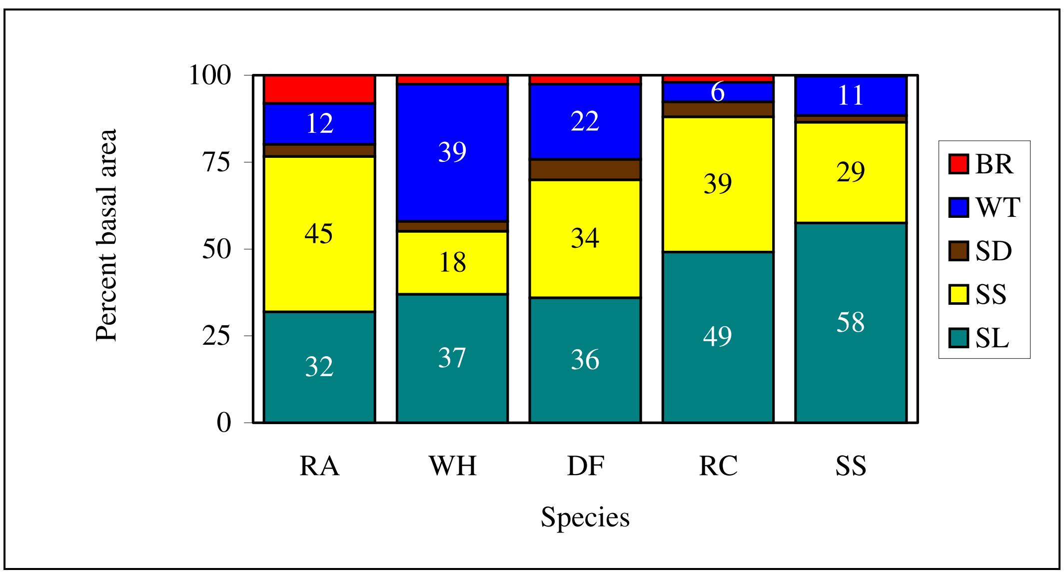

Figure 15. Status of all stems (total basal area) by species.
SL= standing live; SS= standing stressed; SD= standing dead (sang); WT= windthrow; BR= broken (usually due to wind snap).

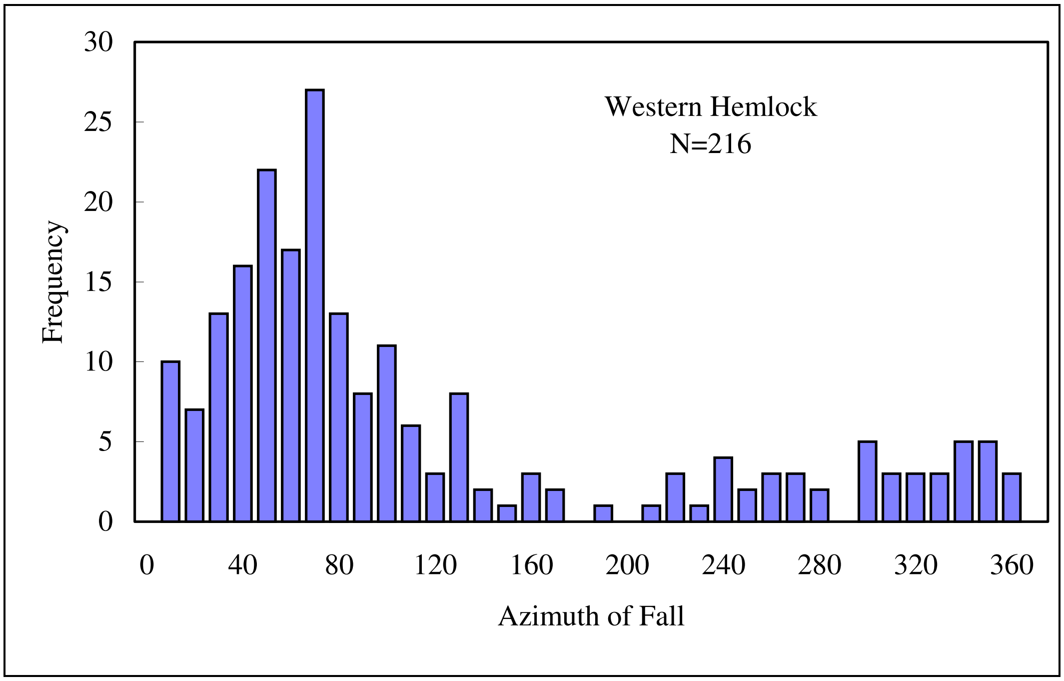

Figure 16. Directional signal for wind thrown western hemlock.

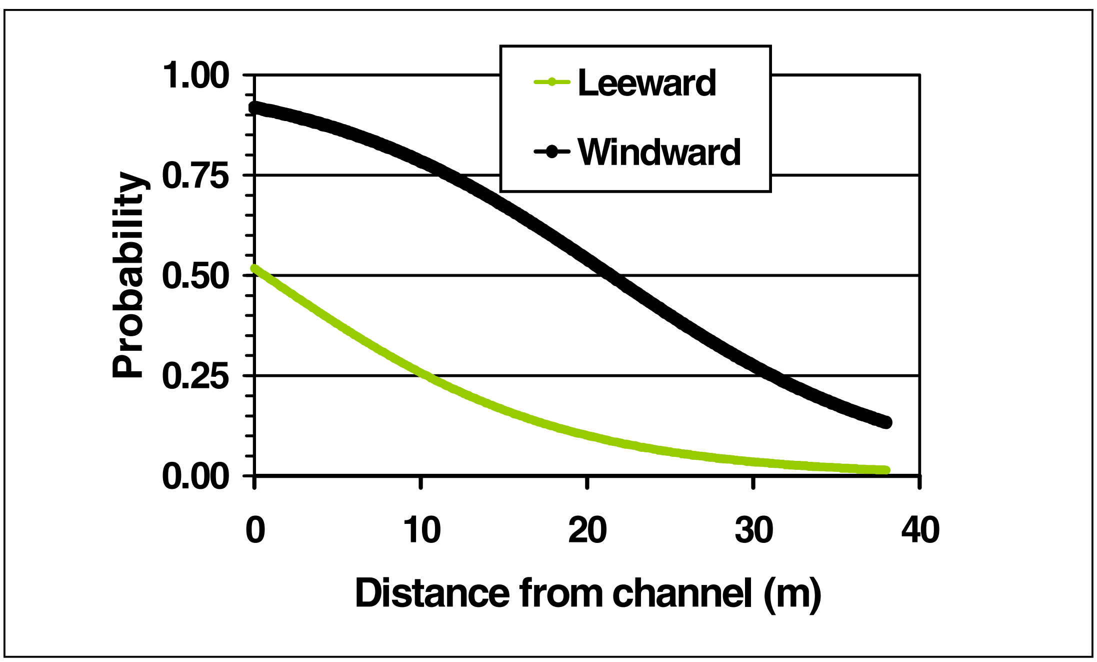

Figure 17. Probability of wind thrown conifer contributing to channel function on windward and leeward stream banks (N=581).
Functional contribution conservatively defined as "any part of the tree breaking the plane of the bank full channel".

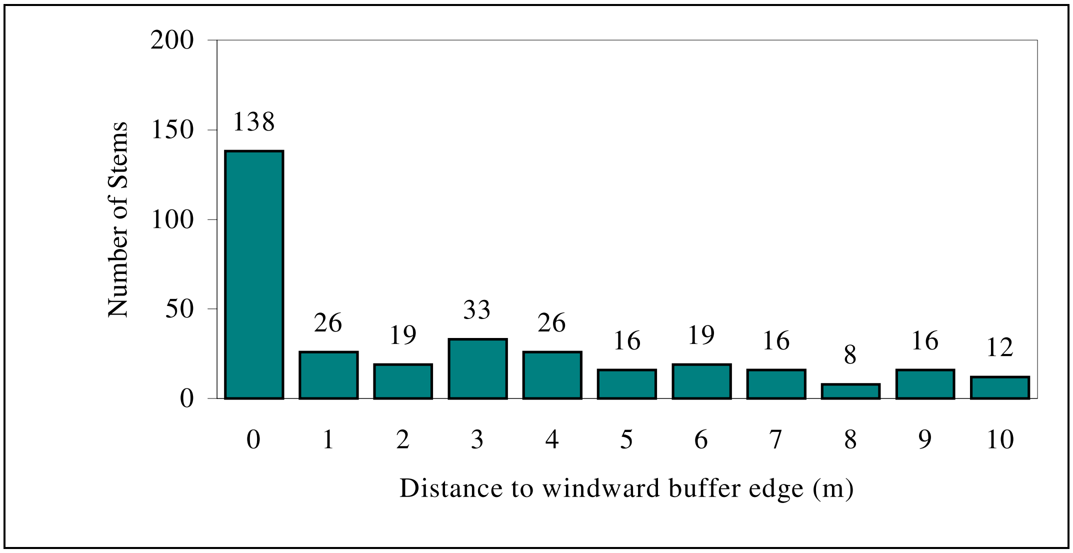

Figure 18. Distance to buffer edge (clear cut) on windward side of stream for wind thrown and wind snap conifer stems.
Pattern of damage suggests that a significant portion of the damage (42 percent) occurs at the buffer edge.

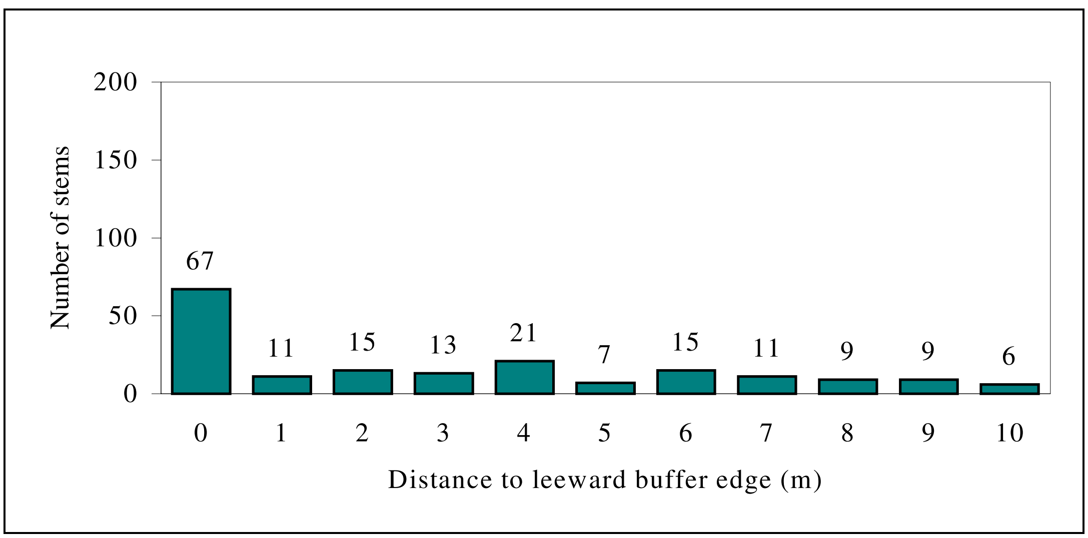

Figure 19. Distance to buffer edge (clear cut) on leeward side of stream for wind thrown and wind snap conifer stems.
Pattern of damage suggests that a significant portion of the damage (36 percent) occurs at the buffer edge.

Appendix F: Changed Circumstances

General

The forest ecosystems on Simpson's lands are the context within which the management prescriptions were designed. These ecosystems are by no means static; they are dynamic, regularly impacted by various physical processes that shape and reshape the habitat for the affected species that occupy those lands. Indeed, the many aquatic and wildlife species for whose conservation this plan is crafted evolved in close association with this ever-changing mosaic of physical and biological elements.

The relationship between fire, flood, and other physical processes in the structure and composition of forest communities and stream systems has been appreciated for a considerable period of time. In general, there is a growing awareness of the role and Importance of fire, and windstorms and other more localized disturbance agents, in the maintenance of animal communities and habitat within the North American landscape, including the Pacific Northwest coastal forests. *(See e.g.,* Franklin & Dyrness 1973; Brown *1985;* Henderson, et. al. 1989; Morrison & Swanson 1990; Agee 1991, Reeves et. al. *1995).*

The physical processes that affect the biodiversity and landscape ecology of Simpson's lands are usually of moderate intensity and relatively confined in geographic extent and magnitude of impact. Nonetheless, historically in some forest environments covered by this HCP, physical processes have been of catastrophic intensity, particularly from the standpoint of impact to individual plants and animals, and these events can affect large areas of the forested landscape. That these physical processes can significantly alter stream and forest habitat has been a substantive consideration in the development of this HCP. In fact, the intent of the HCP is to minimize management-related disturbances and create conditions that enable natural disturbances to create productive habitat.

Simpson recognizes that the temporal and spatial configurations of future natural disturbances (and their specific related effects on the aquatic and wildlife species covered under the HCP) are inherently unpredictable. The fact that certain types of natural disturbances will occur at some time during the term of this Plan and at some location in the Plan Area is, however, reasonably foreseeable and likely. The management prescriptions set forth in Section *5* were designed, in large part, to be responsive to historic disturbance patterns. Indeed, many of the prescriptions are intended to develop a landscape capable of delivering valuable functions and input in response to such natural disturbances. Therefore the occurrence of most natural disturbances will not create conditions that should require the implementation of revised prescriptions.

Certain reasonably foreseeable disturbances, however, may be of such a magnitude, occur with such an "impulse", or impact such particular portions of the Plan Area as to require the application of supplemental prescriptions for the protection of the covered species. These supplemental prescriptions are set forth below. (Except as otherwise noted, implementation of these additional measures will not be deemed "adaptive management" for purposes of this Plan and the costs of implementing such measures will not be applied against the adaptive management cap.) Except as described in the following subsections, however, any other change in circumstances will be adequately addressed by the application of the Section 5 prescriptions (as the same may be adjusted from time to time by the application of adaptive management under Section 10 hereof).-

Fire

The Role of Fire on the Olympic Peninsula

Fire is a significant agent in determining forest structure in the Pacific Northwest, but its effects, intensity, and frequency vary considerably (Agee & Edmonds 1992). Although it is possible to generalize that fire is an important element of forest ecology, it is not possible to specify the temporal or spatial effects of fire for any given area This is so because invariably, fires are not uniformly distributed through time (Morrison & Swanson 1990), the areas affected often differ markedly (Henderson et. al, 1989), and the intensity and scale vary considerably (Morrison & Swanson 1990). Regional examples of the role of fire over the past several hundred to a few thousand years demonstrate this variability.

Fire history of the Olympic Peninsula is reasonably well documented for the last 1,000 years (from tree ring counts) but prior to that, only inferences can be made based on charcoal in core samples from bogs and lakes and other paleoecological evidence (Henderson et. al. 1989). Three periods of extensive forest burning have occurred on the Olympic Peninsula during the past 700 years. All three of these periods saw many fires burning and joining together in some cases to cover over a million acres on the Peninsula alone. The first was a very large fire in about 1308, the second burning occurred over a 90 year period between 1448-153 8 with the largest fire of the period occurring in about 1508, and the third period was between 1668 and 1701, with the largest fire of the period occurring in about 1701 covering more than a million acres on the Peninsula alone (Henderson et. al. 1989). Simpson is piecing together the fire history of the Plan Area under contract to the U. S. Forest Service. So far this work has documented two other large fires not common to other parts of the Olympic Peninsula that burned in the Wynoochee River watershed, in about 1442 and 1571 (Peter and Henderson 1996). Many smaller fires have burned in the Olympics and parts of the Plan Area since settlement but none have been of the magnitude represented by these large fires which appear to have been driven primarily by climatic variation. Of these smaller fires the two largest, in the neighborhood of 30,000 acres, occurred in the dryer east and north portions of the Peninsula. Only three others exceeded 10,000 acres and most of these were less than 5.000 acres.

In light of this analysis, it is not reasonably foreseeable that large-scale, stand-replacing fires (i.e. a fire covering more than 10,000 acres) will occur on Simpson's lands during the life of this HCP. Thus, it is unnecessary to provide for new, different, or additional mitigation or conservation, including management restrictions or reserve configurations, based on any speculation that such events could occur, as these events qualify as unforeseen circumstances. Certain supplemental procedural prescriptions, however, will be applicable in the event of smaller fires.

Fire - Supplemental Prescriptions

If during the term of the Plan, a small fire (less than 10,000 acres) shall occur in the Plan Area, Simpson may take all measures reasonably necessary to extinguish the fire, including measures that deviate from the Section *5* prescriptions. The strategy for responding to and suppressing forest fires is generally established by the Washington Department of Natural Resources and Simpson may have little ability to influence such strategy. However, to the extent reasonably possible and where consistent with the primary goal of containing and extinguishing the fire, Simpson will encourage the development of a fire-response strategy that is consistent with the Section *5* prescriptions and that furthers rather than diminishes the functions that such prescriptions have been designed to provide.

If the fire involves more than 50 acres in the CUP and AGL, 100 acres in the CIS and SIG, or 500 acres in the ROP, Simpson will provide both Services with information regarding the fire within 30 days. Once such a fire is extinguished and unless such fire is an "unforeseen circumstance", i.e. greater than 10,000 acres, Simpson and the Services will confer to establish appropriate supplemental or changed prescriptions for further harvest activities in the fire zone. These additional or changed prescriptions will be established consistent with the following principles:

(a) Simpson will not be allowed to remove more timber than it would have been allowed to remove under Section 5 had no fire occurred in the stand unless the Services determine that the removal of such additional timber would not materially reduce the functional benefit of such habitat for any covered species.

(b) The removal of all standing or downed trees and the conduct of all other salvage or post fire operations shall be done with reasonable care to minimize soil erosion and to retain adequate structural features within the fire zone consistent with provisions in Section 5.

(c) Preservation and development of habitat legacies created by the fire (e.g. upland snags) that are consistent with future management of the stand and the provisions in Section 5 will be sought.

(d) Reforestation of the RCRs consistent with (c) above will be implemented.

Wind

The Role of Wind on the Olympic Peninsula

Brief but violent windstorms sometimes wrack the Northwest Coast including the Olympic Peninsula, starting as tropical typhoons and carried to land by the jet stream (Lily 1983). The historical record shows a small number of hurricane force storms hit the coast in the last 200 years, two of which had winds in excess of 150 mph (Henderson et. al 1989). The most widespread and violent of these storms were the 1921 storm, referred to as the “Big Blowdown” by early residents of the Peninsula, and the Columbus Day storm of 1962. Both of these storms blew down billions of board feet of standing timber (Pugh 1963), but occurred before riparian buffers were common place features in managed forests of the Northwest.

Over the last decade (during which time riparian buffers have been frequently employed), this region has experienced some locally strong winds, on the order of 50-70 mph. While these winds are easily strong enough to uproot trees, severe disturbances have always been localized in the Plan Area *(See* discussion, Appendix E). Windthrow in riparian buffers is expected in the future, but based on Simpson’s experience, the reasonably foreseeable effect of such windthrow will be limited to individual trees or small clumps of trees. This windthrow is normal across the managed landscape and an expected part of the forest ecology and was contemplated when the mitigation measures for this plan were designed.

Small-scale windthrow is not expected to have a long-term significant adverse impact on stream shading or water temperatures and will have the beneficial effect of introducing large woody debris into streams that currently lack this habitat-forming element. Thus, small-scale windthrow does not pose so substantial an impact as to threaten an adverse change in the status of any Permit or Plan species, and may actually benefit aquatic species through natural modifications to stream habitat. Based on historic experience within the Plan Area, a windstorm that results in the complete blow-down of more than 300 meters, measured along the length of the stream, of trees within an RCR, however, is not reasonably foreseeable, and would be considered an unforeseen circumstance.

Windthrow - Supplemental Prescriptions

If a windstorm results in the complete blow-down of more than 100 meters of previously standing timber, measured along the length of the stream, Simpson will provide both Services with information regarding such windthrow within 30 days of its discovery. With respect to such windthrow, and unless such windthrow constitutes an "unforeseen circumstance", i.e. greater than 300 meters complete blow-down, Simpson and the Services will confer to establish appropriate supplemental or changed prescriptions for salvage harvest of the windthrow. These additional or changed prescriptions will be established consistent with the following principles:

(a) Simpson will not be allowed to remove more timber than it would have been allowed to remove under Section 5 had such stand not been the subject of such a wind storm unless the Services determine that the removal of such additional timber would not materially reduce the functional benefit of such habitat for any Permit Species.

(b) The removal of all downed trees and the conduct of all other salvage or post windstorm operations shall be done with reasonable care to minimize soil erosion and to retain adequate structural features within the wind-damaged area consistent with provisions in Section 5.

(c) Preservation and development of habitat legacies created by the windstorm (e.g. upland downed woody debris and broken standing trees) that are consistent with future management of the stand and provisions of Section 5 will be sought.

(d) Reforestation of the RCRs consistent with (c) above will be implemented.

Landslides

The Role and Effects of Landslides on the Olympic Peninsula

Landslides are known to have local and often significant impacts on the character of physical stream habitat and their biological communities. However, landslides and earthflows of many dimensions and driving processes are a natural part of the forested landscape in the Pacific Northwest, replenishing channels with gravel and wood derived from valley slopes and tributary systems (Benda 1990). Without the catastrophic transfer and replenishment of these materials, the habitat of streams in this region ultimately simplifies, supporting fewer species and a less diverse fish community (Reeves et. al. 1995). Thus while the short term effects of landslides can devastate local populations of aquatic vertebrates, landslides and their legacies can actually serve to preserve and perpetuate the habitat that they require and support long term persistence of metapopulations. Logging and road building activities have increased the rate of mass wasting across large areas and changed the character and diminished the quantity of wood they deliver to streams. It is the intent of this Plan to reduce management related landslides and develop forest conditions that enable natural landslides to deliver sufficient quantities and quality of wood for the creation of productive stream habitat.

Landslide rates and processes differ between LTUs with the highest rates being associated with the SIG and the CUP. In the CUP shallow rapid landslides and debris flows are the most common kinds of landslides, whereas the SIG landscape is prone to SR processes on river and stream escarpments in the Montesano sandstone, and relatively small slumping and large persistent deep seated landslides in siltstone lithologies. In the CIS, unconsolidated sandy soils are subject to slumping and flowage type landslides while the AGL landscape produces shallow rapid landslides that occur on slopes underlain by compact glacial till acting as bedrock. These different landscapes with their particular mass wasting processes present varying sensitivities to management activities. Conservation and mitigation measures for within this plan were designed to address sediment and other habitat effects from past landslides, to take advantage of future naturally-occurring landslides, and through a comprehensive series of stream buffer prescriptions, land management restrictions, slope stability analyses, and sediment monitoring, to avoid significant adverse impacts from management related landslides and mass wasting events in the future.

Generally, landslides that cause alteration of the in-stream habitat condition in any watershed are part of the ordinary ecology of the forested landscape and are adequately addressed by the existing conservation and mitigation measures. Based on historic experience within the Plan Area, a landslide that results in the delivery of more than 250,000 cubic meters of sediment is not reasonably foreseeable, i.e. an unforeseen circumstance.

Landslides - Supplemental Prescriptions

If a landslide results in the delivery of more than 10,000 cubic meters of sediment to a channel (either from a source area or from combined source area and propagated volumes; may represent a shallow rapid landslide of between 1 and 2 hectares or a debris flow between 300 to 600 meters long), Simpson will provide both Services with information regarding such landslide within 30 days of its discovery. With respect to such a landslide, and unless this landslide constitutes an “unforeseen circumstance”, i.e. delivery of more than 250,000 cubic meters, Simpson and the Services will confer to determine if it is reasonably possible that management activities on or adjacent to the area of the landslide could have materially contributed to causing such landslide. If either Service or Simpson concludes that it is reasonably possible that management activities materially contributed to the occurrence of such a landslide, Simpson, at its own expense, will retain a qualified geo-technical expert to analyze the slide and develop a written report. (Minimum qualifications for said expert shall be certification for Level II Washington State Watershed Analysis mass wasting module). The report will include, at a minimum, an assessment of the factors likely to have caused the slide and any changes to management activities which had they been implemented on or adjacent to the area of the slide would have likely prevented the slide from occurring. Upon receipt of such a report, Simpson will forward the report to the Services. Simpson will also make such report available to the SAT prior to its next scheduled meeting. Where appropriate, the recommendations set forth in the report may form the basis for adaptive management changes to the unstable slopes prescriptions under Section 10 of this Plan

Floods

Floods are a natural and necessary component of stream ecosystems. For example, floods transport and sort sediment, deposit fine sediments, organic materials and chemical nutrients onto flood plain surfaces, recruit large woody debris, and scour pools and create other beneficial aquatic habitats. Changing river courses also periodically provide opportunities for the establishment of new riparian stands. Alluvial terraces along river valleys provide ideal growing conditions for hardwood and conifer stands and are one of the most dynamic vegetative mosaics in the forested landscape. The aquatic component of the HCP recognizes the dynamic nature of channel networks and accounts for the effects of flood by, among other things, prohibiting harvest in channel migration or channel disturbance zones, allowing for natural floodplain processes to positively amplify the effects of flooding on aquatic systems.

Floods that are lesser in magnitude than a 100-year recurrence interval event (i.e., less than a 100-year flood) are part of the expected normal ecology of the forest. The mitigation and conservation measures in the plan are adequate mitigation for such floods. Based on historical evidence in the Plan Area, a flood that is greater in magnitude than a 100-year recurrence interval event is not reasonably foreseeable.

Insect Infestations

Although forest pest infestations have not played a significant historic role in evolution of western Washington forests, occasional outbreaks may occur.

Insect Infestations - Supplemental Prescriptions

If an insect infestation occurs that poses an economic threat to Simpson, this would be considered a changed circumstance and Simpson and the Services will confer to establish appropriate supplemental or changed prescriptions for salvage harvest of the damaged timber. Theses additional or changed prescriptions will be established consistent with the following principles:

(a) Simpson will not be allowed to remove more timber than it would have been allowed to remove under Section 5 had such stand not been the subject of such an insect infestation unless the Services determine that the removal of such additional timber would not materially reduce the functional benefit of such habitat for any Permit Species.

(b) The removal of all timber and the conduct of all other salvage or post salvage operations shall be done with reasonable care to minimize soil erosion and retain adequate structural features within the affected area consistent with the provisions in Section 5.

(c) Preservation and development of habitat legacies created by the insect infestation (e.g. upland snags) and that are consistent with future management of the stand and the provisions of Section 5 will be sought.

(d) Reforestation of the RCRs consistent with (c) above will be implemented.

Swiss Needle Cast

The Occurrence of Swiss needle Cast on the Olympic Peninsula

Swiss needle cast is a pathogenic fungus (Phaeocryptopus gaeumannii) that attacks Douglas fir, retarding growth and in severe cases causing death of the tree. The pathogen is native to North America and occurs throughout the Douglas fir region. Until recently it has been considered unimportant since it did not cause appreciable damage to infected stands. In the late 1970s and early 1980s, severe Swiss needle cast was reported in some managed plantations from Oregon and Washington but its occurrence was attributed to off site plantings or local environmental conditions. Since then it has become increasingly common in both managed plantations and naturally established stands on the north coast of Oregon and has spread to the Washington coast.

The control of Swiss needle cast in young Douglas fir plantations is problematic as fungal spores are airborne and infection is rapid. Options available to the forest land manager are few. The principal defense against Swiss needle cast is the establishment of an appropriate species mix in managed plantations. Swiss needle cast severely affects stands of Douglas fir that have been planted in landscapes that naturally favored hemlock, cedar and spruce due to predictable fog and moisture patterns. Options for managing infected stands include cutting out the Douglas fir in favor of resistant species such as hemlock during pre-commercial thinning, underplanting or interplanting with resistant species or in severe cases early regeneration harvest, starting over with resistant species. Traditional chemical solutions are not considered operationally feasible to improve growth of the stands and reduce the infection rate.

It is foreseeable that the plan area could be affected by Swiss needle cast within the life of the plan. However, the extent or severity of that infection cannot be predicted. Simpson is initiating precautionary measures through its intensive forestry management program primarily by establishing mixed species plantations or replanting entirely with resistant species such as hemlock. As nearly as possible Simpson currently endeavors to match the species mix to the natural plant potential of the site and does not plant only Douglas fir. It is in the best interests of the company to prevent Swiss needle cast infestations and they are managing their stands to avoid the problem in the future. Based on what is known about conditions that favor Swiss needle cast, it is not foreseeable that the entire plan area, owing to its diverse precipitation, moisture patterns and elevations would become infected.

Swiss Needle Cast - Supplemental Prescriptions

While it is nearly impossible to establish thresholds such as was done for several other disturbance elements in the HCP (e.g. fire, wind, ice storms or landslides), in the face of such uncertainty, it seems prudent to set some initial criteria to trigger action. Any such actions would be proposed to the SAT and the Services prior to their implementation, however, an anticipated response is set forth below. The goal of any such actions would be to return the riparian forest to a productive state so that full riparian and stream function would eventually be realized. If a Swiss needle cast infection occurs in more than 20% of the RCR (in any LTU) to such an extent that future riparian and channel functions are likely to be materially degraded when compared to the functionality of corresponding healthy RCR this would be considered a changed circumstance and Simpson and the Services will confer to establish appropriate supplemental or changed prescriptions for stand treatment of the stands including reforestation options. Such impairment would be based on actual infection rate and a finding that growth was being significantly retarded. Theses additional or changed prescriptions will be established consistent with the following principles:

(a) Simpson will not be allowed to remove more timber than it would have been allowed to remove under Section 5 had such stands not been the subject of such an infection unless the Services determine that the removal of such additional timber would not materially reduce the functional benefit of such habitat for any Permit Species.

(b) The removal of all timber and the conduct of all other salvage or post salvage operations shall be done with reasonable care to minimize soil erosion and retain adequate structural features within the affected area consistent with the provisions in Section 5.

(c) Preservation and development of habitat legacies created by the infection (e.g. upland snags) and that are consistent with future management of the stand and the provisions of Section 5 will be sought.

(d) Reforestation of the RCRs consistent with (a and c) above will be implemented.

Ice and Severe Cold Weather

The Role of Ice Storms on the Olympic Peninsula

Periodically ice storms and severe cold weather suddenly strike parts of the Olympic Peninsula. They occur as a product of unique local weather patterns and two such events have left their mark on forest stands in the plan area. In the recent past an ice storm struck in December 1996 that had a significant effect on individual trees and entire forest stands of the plan area, damaging some 75,000 acres. Prior to this the most recent such storm occurred in November 1951. In the 1996 event, ice that built up on tree limbs and tops causing significant breakage of limbs and top leaders. Red alder were some of the hardest hit due to their relatively brittle nature. In 1951 however, the damage was occasioned by a severe cold air mass that moved in suddenly, dropping temperatures more than 40 degrees in a matter of hours. In this case the extreme cold froze the leaders of many of the younger trees causing the tops to die off, creating defects which over time turned many trees into excellent habitat for wildlife. Such trees today have defect or rotten spots that are valuable structure for many species of wildlife. The 1996 storm created many similar defects and in many cases green trees were converted directly to snags when all of the crown broke out.

Ice and Severe Cold Weather - Supplemental Prescriptions

If an ice or severe cold weather event results in damage to more than 10,000 acres of forestland, Simpson will provide both Services with information regarding such damage within 30 days of its discovery. With respect to such ice or severe cold weather damage, and unless such damage constitutes an "unforeseen circumstance", i.e. greater than 100,000 acres, Simpson and the Services will confer to establish appropriate supplemental or changed prescriptions for salvage harvest of damaged trees or restoration work in the younger plantations. These additional or changed prescriptions will be established consistent with the following principles:

a) Simpson will not be allowed to remove more timber than it would have been allowed to remover under Section 5 had such stand not been the subject of such an ice or severe cold weather event unless the Services determine that the removal of such additional timber would not materially reduce the functional benefit of such habitat for any Permit Species.

b) The removal of all damaged trees and the conduct of all other salvage or post ice or severe weather event operation shall be done with reasonable care to minimize soil erosion and to retain adequate structural features with the ice or severe cold weather damaged area consistent with provisions in Section 5.

c) Preservation and development of habitat legacies created by the ice or severe cold weather event (e.g. upland downed woody debris and broken standing trees) that are consistent with future management of the stand and provisions of Section 5 will be sought.

Earthquake

The region in which Simpson's lands are located has experienced infrequent earthquakes. Generally in the forest environment, while localized landslides or tree throw may result from earthquakes, rarely are such events the source of significant aquatic or wildlife habitat impacts. However, coincident with a major earthquake that hit the Puget Sound region about 1,100 years ago, mass wasting created landslide-dammed lakes in several Olympic Peninsula headwater streams, including one in the Plan Area, Lower Dry Bed Lake (Logan et al. 1998). Earthquakes like the one a millennium ago that are of such magnitude to substantially alter aquatic systems or require additional conservation or mitigation measures are not reasonably foreseeable during the life of the HCP. Earthquake-caused landslides, if any, will be addressed pursuant to the "Landslides" subsection of this Changed Circumstances section.

Pending Lawsuit - Cooperative Sustained Yield Unit

Simpson has commenced litigation against the United States of America in the United States Court of Federal Claims under Case No. 00-198C and in the United States District Court for the Western District of Washington at Tacoma under Case No. C00-5207-RJB. In the action pending in Federal District Court, Simpson has asked the court for an order compelling specific performance of the Cooperative Agreement for the Management of the Participating Forest Properties in the Shelton Cooperative Sustained Yield Unit entered into between Simpson and the United States in 1946. The Federal District Court action asks, in the alternative, that the Court grant a quiet title remedy.

The CSYU agreement requires that national forest land within the boundaries of the Sustained Yield Cooperative Unit ("Unit") be managed for continuous and sustained forest production. Since the CSYU agreement was entered into, the management regime for federal forests in the Northwest has been substantially altered. Specifically, the adoption of the 1994 Northwest Forest Plan and its associated regulations has resulted in a virtual shutdown of all harvest on the federal forest lands within the Unit. This has left intact tracts of late-successional stage forests in the Olympic National Forest immediately to the north of the Plan Area. Under the 1994 Northwest Forest Plan, 40% of the federal lands within 10 miles of the Plan Area were allocated to Late Seral Reserves while the remaining 60% were allocated to Adaptive Management Areas. These restrictions were likely to result in significant increases in the amount of land managed for late-successional forest characteristics on Olympic National Forest lands over the term of the plan.

Simpson's HCP has been considered by the Government on the assumption that such habitats in the portions of the Olympic National Forest immediately north of the Plan Area would be preserved and protected over the term of the plan. For example optimal habitat for the Pileated woodpecker and the Marbled murrelet is found within late-successional coniferous forests.

If Simpson is successful in its litigation and (a) Simpson secures a final order of the court (after the exhaustion of all appeals) compelling specific performance of the CSYU agreement; (b) such specific performance requires the United States of America to make timber in the Olympic National Forest available to Simpson for harvest that is non-compliant with the NW Forest Plan and the Aquatic Conservation Strategy therein; and (c) Simpson conducts any such non-compliant harvesting, this shall constitute a "CSYU changed circumstance." In no event does this HCP or the related IA or ITP commit the Services to extend coverage for any take of ESA-listed species which might occur outside of the Plan Area. The discussion of the CSYU changed circumstance is designed to address potential changes in the environmental conditions which Simpson has been advised that the Services assumed would continue without change during the Services' analyses and development of the HCP and the related Environmental Impact Statement and the preparation of the related Biological Opinions.

CSYU – Supplemental Prescription

If a CSYU changed circumstance occurs, Simpson and the Services will confer to establish mutually agreeable, appropriate supplemental or changed prescriptions for the conduct of covered activities in the plan area sufficient to ensure continued commitments of the HCP.

Appendix G: Clean Water Act TMDL

Set forth below is the technical assessment report establishing the Total Maximum Daily Load (TMDL) for temperature covering the Plan Area. The report has been submitted by the Washington Department of Ecology (DOE) for the approvals of the Environmental Protection Agency (EPA) pursuant to the federal Clean Water Act.

One of the unique features of Simpson's HCP has been the close coordination between the Services and the state and federal agencies responsible for the implementation of the Clean Water Act. From the outset, Simpson has sought to structure a management regime and related analysis for its properties that would satisfy the requirements of Section 10 of the ESA as well as provide a theoretical framework for the preparation of a TMDL.

The development of this HCP and the development of the TMDL technical assessment report have proceeded simultaneously along parallel tracks. Information and analysis developed for the preparation of the HCP has been useful in developing the TMDL and vice versa. Although neither document is legally dependent on the other, implementation is closely linked by use of the TMDL targets to guide monitoring and adaptive management of parts of the HCP. Specifically as it relates to the HCP, Simpson has been informed that the Services have carefully considered the analysis developed the EPA and DOE in independently evaluating whether Simpson's HCP satisfies the requirement of Section 10 of the ESA. Pursuant to Section 9 and 10 of this HCP, if sediment or heat load allocations (targets) identified in the TMDL are not achieved, the management prescriptions of this HCP may be subject to modification.

It is important to note that the TMDL is a document prepared solely by EPA in consultation with DOE. As such, Simpson has not had a significant role (beyond providing certain baseline data and developing the landscape management framework) in the preparation of, or the development of the analysis set forth in, the attached TMDL technical assessment report. Simpson did attend a public meeting held by the DOE as part of the public review process for the HCP and Draft EIS. DOE and EPA continue to be responsible for the approval and oversight of the TMDL while the Services continue to be responsible for approval and enforcement of the HCP. The TMDL is included as an appendix to this HCP solely for information purposes.

Appendix H: List of Contributors and Advisors

Many people from diverse professional backgrounds participated in the process of developing this HCP. The discussions and debates touched virtually every element of forest land management and resource protection. As would be expected from such a diverse group of individuals, highly divergent views were often voiced. These views, while not always compatible, were effective in airing the issues and balancing the discussion. Although we understand that not all of the participants will endorse each aspect of this HCP, Simpson appreciates the sincerity and energy that was brought to bear on this process by all parties and wishes to recognize their contributions.

E. Keith Simmons	Simpson, Project management
N. Phil Peterson	Simpson, Riparian, fish, amphibians
Gary Schuyten	Simpson, Operational evaluation
Dave Backstrom	Simpson, Operational evaluation
Bob Rogers	Simpson, GIS support and forest inventory
Rick Schmelling	Simpson, GIS support and maps
Joe Breed	Simpson, Legal affairs
Ian Stewart	Simpson, Riparian, fish, amphibians (currently Univ. of Washington)
Greg Schroer	Wildlife, Resources Northwest, Inc.
Jeff VanDuzer	Legal affairs and IA; Davis Wright Tremaine
Chris Mendoza	Aquatic Restoration Consultants, Riparian, fish, amphibians
Lynne Rodgers Miller	M2 Environmental Services, Document editing and production
Steve Landino	National Marine Fisheries Service
Mike Parton	National Marine Fisheries Service
Kathy Cushman	U. S. Fish and Wildlife Service
Linda Saunders-Ogg	U. S. Fish and Wildlife Service
Bill Vogel	U. S. Fish and Wildlife Service
Phil Millam	Environmental Protection Agency
Bruce Cleland	Environmental Protection Agency
Steve Ralph	Environmental Protection Agency
Nora Jewett	Washington Dept. of Ecology
Charles Toal	Washington Dept. of Ecology
Michelle Stevie	Squaxin Island Tribe
Marty Ereth	Skokomish Indian Tribe
Mark Mobbs	Quinault Indian Nation
Bruce Davies	Northwest Indian Fisheries Commission
Janet Burcham	Northwest Indian Fisheries Commission